CITROEN

REPAIR MANUAL

ID 19

TEXT

METHOD OF USING THE REPAIR MANUAL

This Manual includes all the main service operations. Primarily it is intended for left-hand drive cars but the application to right-hand drive cars should present no difficulties as any differences are obvious.

CLASSIFICATION

We have shown at the beginning of this manual a classification of the main units of the car.
The three figured number in front of each unit corresponds to the operation number relating to this particular unit.

METHOD OF NUMBERING

The number is composed of :

a) The indication of the type of vehicle : ID

b) A number of three figures indicating the unit or part of the unit (this number is shown in the general classification).

c) A code number, indicating the type of work, dealt with in the operation. These figures are separated from the number by a hyphen.

Use of the code :

The figure 0 indicates the adjustments.
The figures 1, 4, 7 indicate the replacement of units (removal and refitting).
The figures 2, 5, 8 indicate the stripping down and assembling.
The figures 3, 6, 9 indicate the overhauling (reconditioning).

PRINTED IN ENGLAND

EXAMPLES :

Operation No. ID 334-0 : *Adjustment* of the gear selector control.
Operation No. ID 372-1 : *Replacement* of a driveshaft or a pivot.
Operation No. ID 100-2 : *Stripping and assembling* an engine-gearbox assembly.
Operation No. ID 442-3 : *Overhauling* a steering assembly.
Operation No. ID 453-4 : *Replacement* of a pedal gear.

PARTICULAR POINTS

At the beginning of each operation the particular points are given (tightening torsions, adjustment dimensions, special assembly precautions, etc.).
The number of the line of the particular points corresponds with the number of the paragraph in the operation.

ILLUSTRATIONS

At the top left-hand corner of each illustration is shown the number of the operation concerned with this particular illustration (this information is not given on the illustrations for the tools).

TOOLS

The special tools used for repairing the ID 19 are indicated as follows :

1. By a number, suffixed by the letter T. These tools are sold by Établissements FENWICK, 15, rue Fénelon, Paris (10^e). They should not be ordered direct but orders should be passed through the usual channels as for normal spare parts requirements.
2. By a number prefixed by the letters MR which are not supplied by us. The necessary information and dimensions for making them are shown in this manual.

TECHNICAL INFORMATION

Any enquiries should be addressed to: SERVICE DEPARTMENT, CITROEN CARS LIMITED, SLOUGH, BUCKS, ENGLAND.

WORK ON THE HYDRAULIC UNITS

When carrying out work on the hydraulic units, precautions must be taken to ensure conditions of the strictest cleanliness (see Op. ID 00).

WORK ON THE BODY, AND UNDERBODY REPAIR

To preserve the vehicle's roadholding and breaking qualities, it is essential to locate correctly components to which mechanical parts are fitted.

This can only be achieved by using a surface plate No. 2600-T, designed by our REPAIR METHODS Department, and sold by FENWICK.

The "ID - DS 19 Bodywork Repair Manual" lists all spares sold by our SPARE PARTS Department.

NOTE.

There are in the trade surface plate which are cheaper and which can be used for repairing cars of different makes. We do not advise the use of these surface plates as they are not sufficiently sturdy and lack the accuracy required for repairing our vehicles.

In fact, it must be remembered that mechanical components are fitted directly onto Citroen bodies and that the vehicle's qualities (roadholding, braking, tyre wear) depend essentially on the position of these components.

GENERAL CLASSIFICATION

The number in front of each unit corresponds to the operation number relating to this particular unit.

ENGINE 100

- Crankcase 111
- Cylinder head 112
- Timing gear 120
- Suspension 133

- Feed system:

  - Manifolds 141
  - Carburettor and controls 142
  - Air filter 171
  - Petrol pump 173
  - Piping 174
  - Petrol tank 175

- Exhaust system 180

- Ignition system:

  - Distributor 211
  - Ignition coil 212

- Cooling system:

  - Water pump, pulleys, belts 231
  - Radiator and hoses 232
  - Fan 241

CLUTCH 312

- Controls 314

GEARBOX 330

- Gearbox lid 331
- Controls 334

TRANSMISSION 372

PRESSURE RESERVE

High pressure pump, pressure regulator accumulator, piping 391
Distribution block 393

FRONT AXLE 410
Pivots 413

REAR AXLE 420

FRONT SUSPENSION 433

REAR SUSPENSION 434
Piping 435
Manual height control 437

STEERING 440
Steering wheel 441
Steering rack 442
Steering relays 443

BRAKES 451
Hydraulic control (master cylinder, pedal gear, piping) 453
Mechanical control (hand brake handle, cables) 454

ELECTRICAL 500
Wiring harness 510
Dynamo 532
Starter motor 533

HEATING - DEMISTING 642
Ducting 643
Controls 644

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
GENERAL	ID 00	Work on the hydraulic units	1	21
ENGINE	ID 100-1	Replacement of the engine-gearbox	1	24
		Adjustment of the rear flexible brackets	27	26
		Adjustments of the front crossmember bracket	29	27
	ID 100-2	Stripping and assembling an engine-gearbox assembly. Stripping and assembling for replacement of the engine	1	32
		Stripping and assembling for replacement of the gearbox	23	34
	ID 100-3	Overhauling an engine	1	36
		Grinding the valves.	23	40
		Assembling the oil pump. Adjusting the pressure	24	41
		Replacement of a starter gear ring. Grinding the flywheel.	25	41
		Preparation of parts for the crankshaft line	27	41
		Fitting the cylinder barrels.	33	44
		Fitting the oil seal half shells.	35	46
		Adjusting the end float of the crankshaft.	36	47
		Fitting the timing gear	37	47
		Fitting the oil pump on the engine	38	47
Crankcase	ID 111-1	Work on the crankcase		49
		Replacement of the sump	1	50
		Replace of the sealing half-shells	9	51
	ID 112-0	Adjustment of the valve rocker clearances	1	55
Cylinder head	ID 112-1	Replacement of a cylinder head or a cylinder head gasket	1	56
		Tightening the cylinder head	18	57
	ID 112-3	Overhauling a cylinder head	1	59
		Replacement of valve guides.	2	60
		Grinding the valve seatings	4	60
		Calibration of the valve springs	7	61
	ID 112-4	Work on the cylinder head		63
		Replacement of an inlet rockershaft assembly	1	64
		Replacement of an exhaust rockershaft assembly	15	65
		Replacement of an inlet valve sealing ring	26	67
		Replacement of a valve spring	37	68
		Cleaning a cylinder head cover filter	46	69
Timing gear	ID 120-1	Work on the timing gear		70
		Replacement of a timing chain or timing gears	1	71
		Fitting the timing gears	4	71

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
		Replacement of a camshaft	9	72
		Replacement of a rocker tappet	38	75
Engine suspension	ID 133-0	Adjustment of the engine suspension (on the car)	1	76
	ID 133-1	Work on the engine suspension		77
		Replacement of an upper front crossmember	1	78
		Replacement of a front support arm	16	79
		Replacement of a rear flexible mounting	22	80
		Repairing a flexible engine mounting	44	82
		Pre-adjustment of the rear flexible engine mounting	46	82
		Replacement of a rear arm	50	83
		Replacement of a rear bracket	60	84
Feed system :				
Manifolds	ID 141-1	Replacement of an inlet manifold	1	85
Carburettor	ID 142-1	Replacement of a Solex 34 PBIC carburettor	1	86
		Adjustment of the slow running	11	86
	ID 142-3	Overhauling a Solex 34 PBIC carburettor	1	87
Controls	ID 142-4	Work on the carburettor controls		89
		Replacement of an accelerator control cable	1	89
		Replacement of an accelerator pedal	12	90
		Replacement of a choke control	17	90
Air filter	ID 171-1	Replacement of an air filter	1	92
	ID 171-3	Overhauling an air filter		93
		Overhauling a Vokes air filter	1	93
		Overhauling a Miofilter air filter	4	93
Petrol pump	ID 173-1	Replacement of a petrol pump	1	95
	ID 173-3	Overhauling a Guiot pump	1	96
Piping	ID 174-1	Replacement of a petrol feed pipe (tank to pump)	1	98
	ID 174-3	Repair of a petrol feed pipe (or a flexible suspension return pipe)	1	100
Petrol tank	ID 175-1	Work on the petrol tank		101
		Replacement of a petrol tank	1	101
		Replacement of a filler pipe	19	103

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
		Replacement of an air pipe and an air vent pipe	28	103
		Replacement of a petrol gauge tank unit	42	105
Exhaust	ID 180-1	Work on the exhaust system		106
		Replacement of an exhaust manifold	1	106
		Replacement of an expansion chamber or a front exhaust pipe	16	107
		Replacement of an exhaust silencer	1	108 &
		Replacement of the exhaust outlet pipes	15	109
Ignition system	ID 211-0	Adjustments on the distributor		111
		Adjustments of ignition advance	1	111
		Bench test of a distributor	6	111
	ID 211-1	Replacement of a distributor	1	113
	ID 211-3	Work on the distributor		114
		Reconditioning an SEV distributor	1	114
		Reconditioning a Ducellier distributor	25	116
	ID 211-4	Replacement of an advance control	1	118
Oil system	ID 220-0	Checking the oil pressure (on the car)	1	119
	ID 220-1	Work on the oil circulating system		
		Replacement of an oil pump	1	120
Cooling system	ID 231-0	Alignment of pulleys	1	122
	ID 231-1	Replacement of a water pump	1	124
	ID 231-3	Overhauling a water pump	1	125
	ID 231-4	Work on the pulleys and belts		127
		Replacement of a water pump and dynamo belt	1	127
		Replacement of a water pump and dynamo pulley	7	127
		Replacement of a driving shaft	16	128
		Replacement of a water pump pulley	28	129
	ID 232-1	Work on the radiator		130
		Replacement of a radiator	1	130
		Replacement of a thermostat	12	131
		Checking a thermostat	18	131
	ID 241-1	Work on the radiator and fan		132
		Replacement of a fan	1	132
		Replacement of a fan cowling	3	132

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
CLUTCH	ID 312-1	Replacement of a clutch	1	133
	ID 312-3	Overhauling a clutch	1	134
		Calibrating the springs	6	135
		Refacing the clutch driving plate	5	134
		Adjusting the mechanism	9	135
	ID 314-0	Adjustment of the clutch control		136
		Adjusting the height of the pedal	1	136
		Adjusting the clutch cable	2	136
		Adjusting the clutch clearance	3	136
	ID 314-1	Work on the clutch		137
		Replacement of a clutch fork	1	137
		Replacement of a clutch thrust bearing	9	137
		Replacement of a thrust bearing hub	13	137
		Replacement of a sealing ring (Cyclam)	28	139
	ID 314-4	Replacement of a clutch control	1	140
GEARBOX	ID 330-1	Replacement of a gearbox	1	141
		Oil level	33	145
	ID 330-2	Preparing a gearbox for stripping down	1	146
	ID 330-3	Overhauling a gearbox	1	147
		Preparing the differential	24	154
		Preparing the mainshaft (adjustment of the 2nd and 3rd speed synchro and the lateral clearance of the bearings)	27	155
		Adjustment of the reverse gear	31	158
		Adjustment of the bevel pinion	35	159
		Measuring the clearance between the teeth	38 f)	162
		Adjusting the engagement of the gears (3rd and 4th)	41	163
	ID 330-4	Replacement of a differential shaft, brake disc or differential shaft bearing	1	164
Gearbox cover	ID 331-1	Replacement of a gearbox cover	1	167
	ID 331-3	Overhauling a gearbox cover	1	170
		Adjustment of the clearance of the levers controlling the selector shafts	6	170
		Calibration of the locking leverspring	10	171
		Adjusting the engagement of the gears (1st, and 2nd and reverse)	12	171

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
		Replacement of a clutch fork (see Op. ID 314-1)	1	137
		Replacement of a clutch bearing (see Op. ID 314-1)	9	137
		Replacement of a thrust bearing hub and a sealing ring (Cyclam) (see Op. ID 314-1)	13	137
		Replacement of an upper front crossmember (see Op. ID 133-1)	1	78
		Replacement of a pulley or a driving shaft (see Op. ID 231-4)	7-16	127-128
Gearbox selector control	ID 334-0	Adjustment of the gear selector control	1	173
		Adjustment of the control tube	1	173
		Adjustment of the ball controls	2	173
		Adjustment of the change speed selector control rod	3	173
		Adjustment of the selector lever	4	173
	ID 334-1	Work on the gear selector control		174
		Replacement of a ball control	1	174
		Replacement of the balls of the selector bell-crank lever	22	176
		Replacement of a selector support	34	177
TRANSMISSION	ID 372-1	Work on the transmission		179
		Replacement of a driveshaft or a pivot	1	179
		Replacement of a rubber dust cover { gearbox end	15	180
		pivot end	19	181
PRESSURE RESERVE	ID 391-0	Checking and adjusting the pressure reserve units		182
		Checking the valve of the suspension pump for leakage	1	182
		Pressure control valve bench test	4	183
		Checking the initial pressure of an accumulator or a suspension sphere	9	184
		Checking the pressure control valve (on the car)	13	185
		Adjustment of the position of the high pressure pump	18	186
Suspension pump	ID 391-1	Replacement of a suspension pump	1	188
	ID 391-3	Overhauling a suspension pump	1	189
		Grinding the valve seat	4	189
Pressure regulator	ID 391-4	Work on a pressure regulator and accumulator		194
		Replacement of a pressure regulator	1	194
		Replacement of an accumulator or a gasket between the accumulator and pressure regulator	17	195

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
	ID 391-6	Overhauling a pressure regulator		196
		Pressure control valve bench test (see Op. ID 391-0)	4	183
		Checking the initial pressure of an accumulator (see Op. ID 391-0).	9	184
		Checking the pressure control valve on the car (see Op. ID 391-0).	13	185
Piping	ID 391-7	Work on the suspension piping		199
		Replacement of the overflow return pipes of the height corrector	1	199
		Repair of a flexible return pipe (see Op. ID 174-3).		
Distribution block	ID 393-0	Checking a distribution block		201
		Checking the setting of the suspension non-return valves	1	201
		Checking the seating of the valves	4	201
	ID 393-1	Replacement of a pressure distribution block	1	202
	ID 393-3	Overhauling a pressure distribution block	1	203
FRONT AXLE	ID 410-1	Replacement of a front half axle	1	204
		Positioning the half axle on the sidemember	12	205
		Pre-adjustment of the heights	19	206
		Adjustment of the heights (see Op. ID 433-0)	1	233
		Adjustment of the track and steering lock (see Op. ID 440-0)	7-10	261
	ID 410-3	Overhauling a front half axle	1	207
		Adjustment of the castor angle	10 f)	211
Pivot	ID 413-0	Adjustments to the pivot		212
		Adjustments of the upper pivot ball joint	1	212
		Adjustments of a pivot steering lever	5	212
	ID 413-1	Work on the pivot		214
		Replacement of a pivot seal	1	214
		Replacement of a pivot steering lever	5	215
		Replacement of an upper pivot ball joint	16	216
		Replacement of a lower pivot ball joint	28	217
		Replacement of a wheel locking cone	34	218
		Replacement of a wheel positioning dowel	38	218
		Replacement of a pivot (see Op. ID 372-1)	1	179
		Replacement of an anti-roll bar (see Op. ID 433-4)	1	246
REAR AXLE	ID 420-1	Replacement of a rear half axle	1	219
	ID 420-3	Overhauling a rear half axle	1	223

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
	ID 420-4	Work on the rear half axle		228
		Replacement of a wheel stub axle or wheel stub axle bearings	1	228
		Replacement of a bearing seal or a bearing bush	9	230
		Replacement of a wheel locking cone	18	231
		Replacement of an anti-roll bar (see Op. ID 434-4)	1	254
SUSPENSION	ID 433-0	Adjustments on the suspension		232
		Pre-adjustment of the front heights	1	232
		Pre-adjustment of the rear heights	5	233
		Adjustment of the front heights	10	233
		Adjustment of the rear heights	12	234
		Adjustment of the front anti-roll bar	16	235
		Adjustment of the lateral position of the anti-roll bar	16	235
		Adjustment of the anti-roll bar bearings	17	235
		Adjustment of the anti-roll bar side clearance	18	236
		Checking the suspension cylinder for leakage	20	236
		Checking the initial pressure of an accumulator (see Op. ID 391-0).		
Front suspension	ID 433-1	Work on the front suspension		237
		Replacement of a suspension sphere or a damper	1	237
		Replacement of a height corrector	7	238
		Replacement of a suspension cylinder	18	239
		Replacement of a dust cover or a suspension cylinder rod	35	240
		Checking the initial pressure of an accumulator (see Op. ID 391-0).	9	184
Suspension units	ID 433-3	Work on the suspension units		242
		Overhauling a front damper valve	1	242
		Overhauling a rear damper valve	4	243
		Overhauling a suspension cylinder	7	243
		Overhauling a height corrector	13	245
Front anti-roll bars	ID 433-4	Work on the front anti-roll bars		246
		Replacement of an anti-roll bar	1	246
		Replacement of the anti-roll bar bearings	17	247
Rear suspension	ID 434-1	Work on the rear suspension		249
		Replacement of a height corrector	1	249
		Replacement of a suspension cylinder	11	250
		Replacement of a dust cover or a rear suspension cylinder piston rod	26	252
		Replacement of a suspension sphere or a damper (see Op. ID 433-1).	1	237
		Checking the initial pressure of an accumulator (see Op. ID 391-0).	9	184

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
Rear anti-roll bars	ID 434-4	Work on the anti-roll bars		254
		Replacement of an anti-roll bar	1	254
		Replacement of a corrector control rod	7	254
Piping		Replacement of the overflow return pipes of the height corrector (see Op.ID 391-7)	1	199
		Repair of the flexible suspension return pipe (see Op.ID 174-3)	1	100
Height control	ID 437-0	Adjustment of a manual height control	1	256
		Adjustment of the heights (see Op.ID 433-0)	10	233
	ID 437-1	Replacement of a manual height control	1	257
STEERING	ID 440-0	Adjustments on the steering		260
		Adjustment of the lateral position of the steering assembly	1	260
		Adjustment of the alignment of the steering	5	260
		Adjustment of the track	7	261
		Adjustment of the steering lock	10	261
	ID 441-1	Replacement of a steering wheel	1	262
		Replacement of a selector support (see Op.ID 334-1)	34	177
	ID 442-1	Replacement of a steering assembly	1	263
	ID 442-3	Overhauling a steering assembly	1	265
Steering relays	ID 443-1	Work on the steering relays		269
		Replacement of a steering relay	1	269
		Replacement of a lower relay lever (on the car)	19	271
	ID 443-3	Overhauling a steering relay	1	273
BRAKES	ID 451-0	Adjustment of the brakes		275
		Adjustment of a brake unit	1	275
		Centralising the rear brake shoes	4	276
		Checking the faces of the front brake disc (see Op.ID 330-3)	25 b)	154
		Adjustment of the mechanical brake cables (see Op.ID 454-0)	3	302

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
	ID 451-1	Work on the front brakes		277
		Replacement of the front brake shoes	1	277
		Replacement of a brake unit	11	279
		Replacement of a brake disc (see Op.ID 330-4)	1	164
	ID 451-3	Overhauling a brake unit	1	281
	ID 451-4	Work on the rear brakes		286
		Replacement of a rear brake drum	1	286
		Replacement of a rear brake shoe	8	287
		Replacement of a rear brake backplate	18	288
		Replacement of a rear brake cylinder	20	288
	ID 453-0	Adjustments of the Hydraulic Brake Control		
		Bleeding the brake system	1	291
		Adjusting the height of the brake pedal	8-9	292
	ID 453-1	Work on the Hydraulic Brake Control		
		Replacement of a master cylinder	1	293
		Replacement of a pedal gear	12	295
	ID 453-3	Work on the Hydraulic Brake Control		
		Overhauling a master cylinder		
		On cars produced since February 1958	1	296
		On cars produced before February 1958	12	297
		Overhauling a pedal gear		
	ID 453-4	Replacement of an articulating rear brake pipe	1	300
Mechanical brake control	ID 454-0	Adjustment of the mechanical brake control	1	302
		Adjustment of the brake handle lock	1	302
		Adjustment of the control cable	3	302
		Adjustment of the connecting cable	4	302
	ID 454-1	Work on the mechanical brake control		303
		Replacement of a handbrake lever	1	295
		Replacement of a handbrake release trigger	24	297
		Replacement of a locking ratchet	33	298
		Replacement of a control cable	39	306
		Replacement of a connecting cable	51	307
	ID 454-3	Overhauling a handbrake control	1	308
ELECTRICAL	ID 510-1	Arrangement of the electrical installation	1	309
		Table of lamps fitted on the car		

COMPONENT	OPERATION No.	DESCRIPTION	PARAGRAPH No.	PAGE No.
Dynamo	ID 532-1	Replacement of a dynamo	1	314
	ID 532-3	Overhauling a dynamo		315
		Overhauling a Ducellier 7158-A dynamo	1	315
		Overhauling a Paris-Rhone G11.R91 dynamo	25	318
Starter motor	ID 533-1	Replacement of a starter motor	1	321
	ID 533-3	Overhauling a starter motor		322
		Overhauling a Ducellier 6003-A starter motor	1	322
		Overhauling a Paris-Rhone D11.B42	25	325
HEATING AND DEMISTING	ID 642-1	Replacement of a heating and demisting radiator	1	329

No. OF ILLUSTRATION	DESCRIPTION	SERVICE METHODS No.	REFERENCE OF TOOL ON SALE	REMARKS	IMPORTANCE
	NOTE :				
	The numbers appearing in the column headed "IMPORTANCE" have the following significance :-				
	1. Indispensable in all workshops.				
	2. Indispensable in order to save time.				
	3. Indispensable in order to recover parts.				
	4. Of slight use.				
	5. For use on actual vehicle.				
	6. Only for very large workshops.				
	ENGINE				
16	Retaining clip for bonnet	MR-4158			1
111	Jacking bracket		2505-T		2
42	Chain sling		1697-T		6
19	Stand and truck for engine-gearbox assembly		2497-T		6
21 to 24	Adjusting fixture for engine supports		1698-T		2
25	Spanner for adjustment of rear engine supports		1699-T		1
25	Spanner for adjustment of rear engine supports		1700-T		1
25	Spanner for adjustment of rear engine supports		1982-T		1
61	Spanner for hydraulic pipe union (9 mm opening)		2219-T	see pressure reserve	
61	Spanner for hydraulic pipe union (15 mm opening)		2220-T	see pressure reserve	
61	Spanner for hydraulic pipe union (10 mm opening)		2221-T	see pressure reserve	
87	Strap wrench		2223-T	see pressure reserve	
91	Spring compressor		1991-T	see steering	
91	Spanner for screw of steering collar		1994-T	see steering	
54	Spanner for clutch housing screws (two flats)		1677-T		1
61	Spanner for clutch housing screws (hexagon)		2431-T		1
16	Spanner for carburettor		1645-T		1
16	Spanner for sparking plugs		1603-T		1
15	Spanner for crankshaft nut		1667-T		3
15	Spanner for camshaft nut		1731-T		3
15	Fixture for retaining timing wheels		1680-T		2

INDEX OF SPECIAL TOOLS SHOWN IN THE MANUAL

No. OF ILLUSTRATION	DESCRIPTION	SERVICE METHODS No.	REFERENCE OF TOOL ON SALE	REMARKS	IMPORTANCE
16	Socket for connecting rod screws		1624-T		1
5	Valve spring compressor		1614-T		1
5	Fixture for removing and refitting valves		1616-T		1
64	Extractor for oil pump pinion		1964-T		1
4	Grinding wheel for inlet valve seat (120° single cone)		1662-T		1
4	Grinding wheel for top clearance (150° biconical)		1630-T		1
4	Grinding wheel for lower clearance (90° biconical)		1630-T		1
4	Grinding wheel for exhaust valve seat (90° biconical)		1627-T		1
4	Grinding wheel for top clearance (150° biconical)		1627-T		1
4	Grinding wheel for lower clearance (60° single cone)		1633-T		1
4	Valve grinding tool		1615-T		1
6	Fixture for calibrating springs		2420-T		3
11	Fixture for the adjustment of the oil pump	MR-1811			1
7	Torsion spanner		2471-T		1
	Dial gauge for measuring bores		2440-T		1
16	Spanner for plugs closing crankshaft oil-ways	MR-3462-70			4
12	Punched plate for fitting cylinder barrel joints	MR-4134			4
40	Mandrel for centring clutch disc		1712-T		2
13	Piston ring guide		1656-T		1
18	Stand for engine resting on cylinder head	MR-3053-160			4
18	Stand for engine resting on crankcase	MR-3053-170			4
9	Fixture for replacement of valve guides		1644-T		3
9	Reamer for valve guides		1642-T		3
17	Extractor for dust cover		1608-T		2
58	Fixture for alignment of pulleys		1685-T		1
37	Stand for water pump	MR-3676-180			4
37	Spanner for water pump bearing nut		1646-T		2
37	Extractor for water pump bush		2291-T		3
37	Bush and mandrel for fitting water pump bush	MR-3676-270			3
55	Spanner for nut of water pump driving pulley shaft		1640-T		2
17	Extractor for driving pulley shaft	MR-3404-20			2
20	Fixture for adjustment of the position of the High Pressure Pump		1693-T		1
	CLUTCH				
40	Mandrel for centring clutch disc		1712-T		2
6	Fixture for calibrating springs		2420-T		3
39	Fixture for clutch adjustment		1701-T		6
39	Finger disc and clamps		1704-T		1
40	Simplified fixture for clutch adjustment	MR-3457-100			1

No. OF ILLUSTRATION	DESCRIPTION	SERVICE METHODS No.	REFERENCE OF TOOL ON SALE	REMARKS	IMPORTANCE
	GEARBOX				
42	Stand for supporting engine on the car and removing gearbox		1797-T		2
42	Support fixture		1799-T		2
54	Spanner for clutch housing screws (two flats)		1677-T		1
61	Spanner for clutch housing screws (hexagon)		2431-T		1
55	Spanner for nut of water pump driving pulley shaft		1640-T		2
101	Lever for disengagement of front brake shoes		2127-T		1
101	Fork for disengagement of brake catch		2128-T		1
101	Spanner for adjustment of front brakes		2129-T		1
53	Stand for gearbox for use on a bench	MR-3053-130			2
54	Spanner for bevel pinion nut		1734-T		2
57	Extractor body		1750-T		1
52	Collet ring and thrust block for differential bearing extractor		1753-T		1
52	Pad for differential shaft bearing extractor		1742-T		1
57	Split collar and pressure pad for bevel pinion front bearing extractor		1738-T		2
55	Spanner for nut of differential bearing (on shaft)		1770-T		1
55	Spanner for nut of differential bearing (in housing)		1771-T		1
57	Spring compressor for locking lever spring		1792-T		2
57	Spanner for spindle caps	MR-3691-80			3
58	Fixture for alignment of pulleys		1683-T		1
56	Mandrel for positioning fork control balls		1793-T		2
6	Fixture for calibrating springs		2420-T	see engine	
52	Mandrel for fitting differential bearings		1768-T		3
55	Mandrel for fitting the oil seal on the differential shaft		1767-T		1
55	Mandrel and bush for fitting the seal in the outside of the differential bearing housing		1772-T		3
13	Straight edge for dial gauge	MR-3377			1
54	Mandrel for mainshaft bearing	MR-3045			3
54	Mandrel for assembly of bevel pinion	MR-3676-30			3
50	Fixture for adjusting crown wheel and bevel pinion		2044-T		1
51	Fixture for adjustment of differential bearings		1766-T		1
51	Dial gauge extension (differential bearing adjustment)		2438-T		1
50	Support for dial gauge (adjustment of tooth clearance)		2039-T		1
50	Dial gauge extension (adjustment of tooth clearance)		2439-T		1
61	Spanner for ball joint cups	MR-3691-60			2
61	Press for fitting selector ball joints		2427-T		1
	PRESSURE RESERVE UNITS				
125	Hydraulic test bench		2290-T		1
61	Spanner for hydraulic pipe union (9 mm opening)		2219-T		1
61	Spanner for hydraulic pipe union (10 mm opening)		2221-T		1

No. OF ILLUSTRATION	DESCRIPTION	SERVICE METHODS No.	REFERENCE OF TOOL ON SALE	REMARKS	IMPORTANCE
61	Spanner for hydraulic pipe union (13 mm opening)		2222-T		1
61	Spanner for hydraulic pipe union (15 mm opening)		2220-T		1
87	Strap wrench		2223-T		1
89	Cone for fitting ring seal on high pressure pump cylinder		2227-T		1
88	Wooden jaws	MR-3407-30			1
	Spring balance		2472-T		1
87	Spanner and spindle for removing pressure regulator cap		2224-T		1
89	Mandrel for fitting the pressure regulator ring seal		2226-T		1
13	Straight edge for dial gauge	MR-3377		see engine	
51	Extension for dial gauge		2438-T	see gearbox	
89	Mandrel for fitting ring seal on bleed screw		2225-T		1
	TRANSMISSION - FRONT AXLE				
64	Extractor for steering rod ball pin		1964-T		1
64	Pressure pad		1968-T		1
113	Gauge for pre-adjustment of the heights		2307-T		1
65	Vice support for half axle	MR-3053-120			2
64	Extractor for axle arm		1864-T		1
64	Spanner for anti-roll bar ball joint	MR-3691-40			3
66	Vice support for pivot		1922-T		1
66	Spanner for nut between hub and shaft		1920-T		1
63	Extractor for lower cup of upper pivot ball joint		1856-T		1
63	Fixture for fitting the lower cup of the upper pivot ball joint		1857-T		1
67	Mandrel for fitting the sealing joints	MR-3676-140			3
67	Mandrel for fitting the sealing joints	MR-3676-150			3
69	Bush for adjustment of castor angle		1865-T		1
69	Bush for adjustment of castor angle		1866-T		1
69	Fixture for adjustment of castor angle		2321-T		1
13	Straight edge for dial gauge	MR-3377		see engine	
64	Tool for adjustment of levers or pivots		1867-T		1
7	Torsion spanner		2471-T	see engine	1
	REAR AXLE				
73	Vice support for axle arm	MR-3053-90			2
74	Extractor for stub axle hub		2018-T		3
54	Spanner for brake backplate screws		1677-T	see engine	
75	Extractor for hub bearing (outer cup)		2019-T		1

No. OF ILLUSTRATION	DESCRIPTION	SERVICE METHODS No.	REFERENCE OF TOOL ON SALE	REMARKS	IMPORTANCE
72	Extractor for hub bearing (inner cup)		2020-T		1
103	Spring pliers		2110-T		2
105	Fixture for rivetting the brake cam pins	MR-3354-40			6
104	Mandrel for fitting the hub oil seal	MR-3676-170			3
106	Fixture for checking concentricity of brake linings		2115-T		1
77	Fixture for adjusting the hub bearings		2021-T		1
66	Vice support for pivot		1922-T		1
77	Fixture for fitting the hub bearings	MR-4114			2
	SUSPENSION				
64	Spanner for adjusting eccentric screw of height corrector		2285-T		2
113	Gauge for pre-adjustment of front heights		2307-T		1
87	Strap wrench		2223-T	see pressure reserve	
87	Spanner for nut fixing height corrector		1623-T		2
17	Ligarex clip pliers		2483-T		1
54	Spanner for the clamp of the corrector control rod		1677-T	see gearbox	1
61	Spanner for hydraulic pipe unions (9 mm opening)		2219-T	see pressure reserve	
61	Spanner for hydraulic pipe unions (10 mm opening)		2221-T	see pressure reserve	
88	Mandrel for fitting corrector cups	MR-3045-80			1
88	Wooden jaws for holding suspension cylinder	MR-3407-30			1
134	Stand for testing suspension cylinder		2293-T		1
	STEERING				
91	Spanner for screw of steering collar		1994-T		2
91	Spring compressor		1991-T		1
92	Spanner for nut locking adjusting cap		1854-T		3
93	Vice support for steering		1999-T		1
92	Extractor for central ball joint		1966-T		1
96	Spanner for rack thrust pad cap	MR-3691-70			2
64	Extractor for steering rod ball pin		1964-T		1
64	Pressure pad		1968-T		1
92	End piece for rack nut		1987-T		1
92	Extractor for central ball joint		1967-T		1
92	Mandrel for half bar silentbloc	MR-3676-110			3
97	Support for the steering pinion		1996-T		1
97	Support for dial gauge for setting steering pinion		1977-T		1

INDEX OF SPECIAL TOOLS SHOWN IN THE MANUAL

No. OF ILLUSTRATION	DESCRIPTION	SERVICE METHODS No.	REFERENCE OF TOOL ON SALE	REMARKS	IMPORTANCE
95	Fixture for adjustment of relay position		1995-T		1
96	Spanner for upper relay spindle nut		1988-T		1
96	Spanner for lower relay spindle nut		1989-T		1
96	Tube for positioning the lower relay bearing		1990-T		1
	BRAKES				
101	Lever for disengagement of front brake shoes		2127-T		1
101	Fork for disengagement of brake catch		2128-T		1
101	Spanner for adjustment of front brakes		2129-T		1
61	Spanner for hydraulic pipe union (9 mm opening)		2219-T	see pressure reserve	
61	Spanner for hydraulic pipe union (10 mm opening)		2221-T		
101	Spanner for front brake bleed screw		2141-T		2
106	Fixture for checking concentricity of rear brake linings		2115-T		2
103	Pincers for rear brake shoe return springs		2210-T		2
105	Assembly for rivetting rear brake cam spindles	MR-3354-40			6
	ADJUSTMENTS				
58	Fixture for alignment of pulleys		1685-T		1
113	Gauge for pre-adjustment of front heights		2307-T		1
64	Spanner for adjustment of heights (corrector)		2285-T		2
69	Fixture for adjustment of castor angle		2321-T		1
112	Gauge for checking wheel camber		2314-T		1
95	Fixture for adjustment of relay position		1995-T		1
7	Torsion spanner		2471-T	see engine	
	VARIOUS TOOLS				
16	Retaining clip for bonnet	MR-4158			
111	Jacking bracket		2505-T	see engine	
17	Ligarex clip pliers		2483-T		
61	Spanner for hydraulic pipe union (9 mm opening)		2219-T	see pressur reserve	
61	Spanner for hydraulic pipe union (10 mm opening)		2221-T		
61	Spanner for hydraulic pipe union (13 mm opening)		2222-T		
61	Spanner for hydraulic pipe union (15 mm opening)		2220-T		

IMPORTANT NOTE

If any irregularity of working occurs make certain that the hydraulic system is under pressure before doing anything else. To do this:
With the engine idling:

- *Unscrew the bleed screw on the pressure control valve (one should be able to hear the release of pressure in the control valve).*
- *Screw up the bleed screw and the valve should cut out in less than 60 seconds (the point of cut out is indicated by a reduction in the noise of operation).*

If the above is not the case, check in the order shown, the following points:

- *That there is sufficient hydraulic fluid in the reservoir.*
- *That the filter in the reservoir is perfectly clean and in good condition.*
- *That air is not being sucked in through the pump inlet pipe.*
- *That the bleed screw has been screwed up.*

TOOLS

IMPORTANT NOTE - For correct functioning of the hydraulic system, it is essential that the fluid and the units of the hydraulic system should be perfectly clean. The strictest precautions must be observed during work on the car and for the storage of the fluid and spare parts.

1 Storage.

Pipes, units and spare parts must be protected form exposure to dust and from impact.
Seals and rubber pipes must be protected from exposure to dust, air, light or heat.
The fluid must be kept in its original container, securely sealed.

2 Precautions during work.

Before starting work, carefully wash the area in which work is to be carried out.
Example: when replacing a rear suspension cylinder, wash the wheel arch.
Before disconnecting a union, carefully wash it and the surrounding area with alcohol.
Then proceed as follows :

a) Unscrew the bleed screw on the pressure regulator.

b) Move the manual height control lever to the low position.

NOTE - These precautions should be observed during work on the master cylinder (2nd position).

3 Precautions to be taken after disconnecting a union.

Seal all open ends of pipes and oil passages with plugs (see Pl. 89, fig. 9):

a) Metal pipes with screw connections.

3 mm dia.	plug D 435-91
4.5 mm dia.	plug D 453-131
6.35 mm dia.	plug D 453-132
8 mm dia.	plug D 391-60

TOOLS

b) Plastic pipes:
Protect ends with cellulose tape.

c) Rubber pipes:
Use cylindrical pegs: 8 mm dia. x 50 mm long and 12 mm dia. x 50 mm long.

4 Protection of Hydraulic units after removal

Seal the openings of the units as dismantling proceeds (see Pl.89):

a) High pressure pump (see fig.1):
1 cap D.391-58 for the feed pipe.
1 plug D.391-88 for the high pressure outlet.
1 cap for the pusher and roller assembly.

b) Pressure regulator-accumulator assembly (see figs. 2 and 5) :
1 cap D.391-60 for the return pipe.
1 plug D.391-63 for union for the connection tube to distribution block.
1 plug D.391-88 for the intake union.
1 cap D.391-111 for the union on the accumulator control valve.
1 cap D.433-82 for the accumulator (pressure regulator disconnected).

c) Distribution block (see fig.3):
3 plugs D.391-63

d) Height corrector (see fig.4):
3 plugs D.391-63
1 plug D.435-91

e) Suspension cylinder (see figs.5 and 6):
1 cap D.433-82 for suspension sphere.
1 plug D.434-70 for connection on suspension for suspension sphere.
1 plug D.434-95 for inlet connection.

f) Master cylinder, 1st arrangement (see fig.7):
1 plug for feed connection.
2 plugs D.391-63 for unions for connecting pipes to brakes.

g) Master cylinder, 2nd arrangement (see fig.8):
1 plug D.391-88 for feed connection.
3 plugs D.391-63 for high pressure inlet connection and unions for connecting pipes to brakes.

h) Front brake cylinders:
2 plugs D.391-63

i) Rear brake cylinder :
1 plug D.391-63

IMPORTANT NOTE - Plugs, caps and pegs must be *thoroughly cleaned before using.*

TOOLS

5 Precautions prior to assembly.

The steel pipes must be blown through with compressed air.
Rubber tubes and sealing rings must be washed with alcohol and then blow off the parts with compressed air.
The hydraulic units must be cleaned in alcohol and no other agent may be used. After cleaning, blow off the parts with compressed air.

6 Fitting the seals (see Pl.89)

a) Sealing sleeves (see fig.10):

NOTE - Sealing sleeves must be replaced after each dismantling operation.

1. Place the sealing sleeve (a) on the pipe. This sleeve must be set back 2 mm from the end of the pipe.
2. Centralise the pipe in the bore by aligning it with the axis of the bore.

VERY IMPORTANT - Make sure that the end of the pipe enters the small bore (at "b").

3. Screw the connecting nut by hand. On some units the axis of the bores is oblique relatively to the face of the boss for the nut.
4. Lightly tighten the nut, 4.3 to 5.7 ft.lbs (0.6 to 0.8 m.kg).

This light tightening of the nut is sufficient to ensure a good seal. Excessive tightening will cause leakage.

b) Sealing rings:

NOTE - Because of their design, the efficiency of these seals increases with the pressure.

Replacing sealing rings:

1. Moisten the sealing ring with hydraulic fluid.
2. Fit a tapered sleeve (2225-T for the pressure regulator bleed screw, see fig.11 - 2226-T for the regulator piston, see fig.12 - 2227-T for the high pressure pump sleeve, see fig.13). ....

Tapered sleeve 2225-T
Tapered sleeve 2226-T
Tapered sleeve 2227-T

7 Fit the sealing ring in position by sliding it over the tapered sleeve.

PARTICULAR POINTS

Removal

5-6 *Release the pressure in the suspension system, drain and remove the fluid reservoir, remove the front suspension spheres.*

9 *Remove the steering (mark its position in relation to the relays and the steering wheel).*

24 *Support the engine-gearbox assembly, disconnect the front crossmember (do not lose the adjusting shims).*

Assembly

27-29 *Adjust the rear engine supports (see OP.ID.133-0) and fit the front crossmember. Fit the adjusting shims, found when dismantling, between the crossmember and the sidemember in order to obtain a difference in the dimension between the brake disc and the sidemember, on each side, of 70 ± 2 mm (use the shims found when dismantling).*

36-40 *Correct and adjust the controls: change speed (see OP.ID.334-0), speedometer, brakes (hydraulic and mechanical, see OP.ID.454-0), clutch (see OP.ID.314-0), carburettor (see OP.ID.142-4) manual ignition (see OP.ID.211-0).*

42 *Fit the steering (note the markings made when dismantling). Fill the fluid reservoir and prime the pump, through the feed pipe.*

49 *Adjust the ignition advance (see OP.ID.211-0). Check the level of the engine oil, 7 pints (4 litres) of SAE.20 oil.*

50 *With the engine idling and the car on the ground, fill the radiator.*

55 *Bleed the brakes (see OP.ID.453-0).*

	REMOVAL	TOOLS
1	Hold the bonnet open (stop MR-4158, see Pl.16, fig.1)	Stop MR-4158
2	Support the front of car on stands (jacking support 2505-T, see Pl.111). Drain the radiator and the cylinder block (retain the liquid, which contains anti-freeze)	Jacking support 2505-T
3	Remove the spare wheel, the retaining bar, front wings, air deflector plate and the brake cooling ducts	12-14 mm spanners and box spanners
4	Remove the battery and the battery tray. Disconnect the starter cable. Disconnect the dynamo leads from the regulator. Remove the gear box earth cable. Remove the starter cable and fitted solenoid from battery rear tiebar	8-12 mm box spanners
5	Release the pressure in the suspension circuit by unscrewing the bleed screw on the pressure regulator	8 mm spanner
6	Remove the fixing straps on the fluid reservoir and remove the battery support. Disconnect the feed pipe from the high pressure pump. Seal the intake pipe and pump openings (see Pl.89). Drain the fluid reservoir and remove it. Seal the apertures in the reservoir and pipes (see Pl.89)	8-12 mm box spanners

		TOOLS
7	To remove the exhaust downpipe :	
	a) Remove the coupling flanges on silencer and manifold.	
	b) Remove collar for securing pipe on its support and withdraw pipe	12-14 mm box spanners
8	To remove the radiator :	
	a) Disconnect the flexible air pipe and remove the radiator tie-rod	8-12 mm box spanners
	b) Disconnect the hoses from the radiator. Disconnect the intake hose from the water pump and withdraw steel pipe.	
	c) Remove securing screws from the radiator and from the exhaust pipe bracket.	
	Remove the bracket, the tie-rod between the left-hand securing bracket, and the radiator and remove the radiator.	
	Remove the rubber blocks from the crossmember supporting the gearbox	14 mm box spanner
9	To remove the steering assembly (see pl. 90 and 93) :	
	Mark the position of the steering pinion relative to the flexible coupling (a dab of paint at "a" opposite the locking groove).	
	Mark the position of the steering gear in the bearing at "b".	
	Disconnect the steering levers (1) from the relay spindles.	
	Remove the set screw (2) from the steering pinion.	
	Remove the bearing caps and withdraw the steering assembly	12-14-16 mm box spanners
10	Disconnect the gear selector control from the gearbox cover (see Op. ID 334-1).	
11	Disconnect the speedometer cable from the gearbox	10 mm box spanner
12	a) Remove the gear selector cable guide and speedometer cable guide from the sidemember.	
	Withdraw the connecting tube (1) (see Pl. 60) and release cables on sidemember	12 mm box spanner
	b) Disconnect the gear selector rod (2) from the relay lever and withdraw the pipe	12 mm box spanner
13	Disconnect the handbrake control (see Pl. 110) :	
	Detach the connecting cable (1) from the right-hand lever (2).	
	Detach the control cable (3) from levers (25 and 26).	
14	Remove the clutch fork control rod.	
	Release protecting tube from its guide on the clutch casing and release the cable	12 mm spanner and box spanner
15	Disconnect the front brake feed pipe from the master cylinder and seal the pipe and master cylinder apertures (see Pl. 89)	Spanner 2219-T or 2221-T

		TOOLS
16	Disconnect the flexible petrol feed pipe from the pump.	
17	Disconnect the accelerator control and the choke control from the carburettor	8 mm box spanner
18	Disconnect the contact breaker feed wires from the coil. Disconnect the ignition advance control from the distributor.	
19	Disconnect the rubber return pipe to the reservoir from the pressure regulator valve. Disconnect the suspension feed pipe from the pipe union in the distribution box (spanner 2219-T or 2221-T, see Pl.61, fig.3). Seal the pipe openings (see Pl.89)	Spanner 2219-T or 2221-T
20	Disconnect the flexible feed pipe to the heating and demisting radiator from the steel pipe on cylinder head.	
21	Remove the front suspension spheres (strap wrench 2223-T, see Pl.87, fig.1) and seal the apertures (see Pl.89).	Strap wrench 2223-T
22	Remove the exhaust pipe screen and remove the nuts from the engine fixing studs on the rear brackets	23 mm spanner
23	Remove the front wheels. Disconnect the flexible couplings (Bibax) from the gearbox driving plates	12 mm socket wrench with extension
24	Remove the fixing screws securing crossmember to sidemembers. Do not mislay either the screws or the adjusting shims between cross and sidemembers	14 mm box spanner
25	Pass a chain sling (chain sling 1697-T, see Pl.42) under the water pump casing. Lift the engine and withdraw it from the vehicle	Chain sling 1697-T
26	Mount the engine-gearbox assembly on a stand (stand 2497-T, Pl.19)	Stand 2497-T
	ASSEMBLY	
27 A	Adjust the rear flexible brackets (*cars delivered before July 1959*) (adjusting fixture 1698-T, see Pl.21,22,23 and 24): 1. To adjust the lateral position of the brackets: a) Measure the dimension on the engine-gearbox assembly. Position the gauge as shown on Pl.21 with the point of pin "A" engaged in the crossmember upper fixing hole, unscrew set screw "B" and slide movable rod "C" so that the pin engages in the hole of plate "D" and in the hole of the suspension arm. Tighten screw "B".	

TOOLS

b) Transfer this dimension to the car (see Pl. 22), moving the bracket (53) as necessary in its grooves so that the flange of the nut (54) engages in the hole in plate "D".
Tighten the nuts .... 12 mm box spanner

c) Repeat the procedure on the other side .... Adjusting fixture 1698-T

2. To adjust the height (see Pl. 23) :

a) Remove the upper fixing screw from the front half axle, on the left and on the right.

b) Insert the pin "F" in the bore for the relay spindle.
Screw pin "G" in place of the front axle fixing screw.

c) Fit the hub "H" of the gauge over pin "F", shift the movable rod "C" until it rests on the pin "G". Tighten set screw "B". Slacken or tighten the nut (54) until the shouldered face "c" is level with the underside of plate "D" (hole "d" for the right-hand side, hole "e" for the left-hand side).

3. To adjust the distances between the brackets (see Pl. 24):
Position gauge "I", move the left-hand bracket (46) in its slots "F" so that the flange of nut (54) enters the hole in gauge "I".

27 B Adjustment of the rear flexible mountings (*cars delivered since July 1959*):

a) Check that the flexible mountings are preset correctly. The top face of the lower nut securing the bracket is 98 mm from the face of the flexible coupling which bears against the steel plate support fixed to the car body.

b) Place the flexible mountings on the engine and tighten the top nut securing the bracket (shakeproof washer).
Slacken the nuts securing the steel plate support to the car body .... 12-23 mm box spanners

c) Offer the engine-gearbox assembly up to the car. Tighten the upper screws securing the crossmember to the sidemembers (plain washer and spring washer under the head of the screw) and insert the shims found during dismantling between the crossmember and the sidemembers (see NOTE, paragraph 29).

d) Lower the engine-gearbox assembly into position. Insert and tighten the flexible mounting fixing screws (plain washer and spring washer under the head) and tighten the nuts securing the support to the body after locating correctly the flexible mounting and the support.................................... 12-14 mm spanner and box spanner

28 Positioning the engine-gearbox assembly (*cars delivered before July 1959*):

Pass a chain sling (chain sling 1697-T, see Pl. 42) under the water pump and raise the engine-gearbox assembly. Lower it on to the car body and place it in position. Remove the sling. Tighten the nuts on the engine fixing studs on the rear flexible mountings .... Chain sling 1697-T
23 mm spanner

29 Secure the front crossmember to the sidemembers. Insert the shims, found during dismantling, between the crossmember and the sidemembers .... 14 mm box spanner

NOTE - The difference in the dimensions between the brake disc and sidemember on each side must be 70 ± 2 mm. If necessary vary the number of shims between crossmember and sidemembers. Keep the total number of shims constant. A shim removed from one side must be replaced on the other.

Tighten the fixing screw (plain and spring washers) .... 14 mm box spanner

		TOOLS
30	Connect the flexible coupling (Bibax) to the gearbox driving plates. Make sure that the locating dowels are in position in their seatings on the coupling. Tighten the fixing screws	12 mm socket with extension
31	Fit the exhaust pipe screen (plain washers under the heads of the screws)..	12 mm spanner
32	Connect the feed hose of the heating and demisting radiator to the steel pipe on the cylinder head. Insert an elastic ring under the hose clip.	
33	Connect the suspension feed pipe to the pipe union on the pressure distribution box (spanner 2219-T or 2221-T, see Pl. 61, fig. 3) .... Connect the reservoir return hose to the pressure regulator. Fit an elastic ring under the hose clip.	Spanner 2219-T or 2221-T
34	Connect the front brake feed pipe to the master cylinder (spanner 2219-T or 2221-T). Couple the brake control cable (3) to the levers (4 and 5) (see Pl. 99). Adjust the connecting cable and the control cable (see Op. ID 454-0)	Spanner 2219-T or 2221-T
35	Connect the manual ignition control to the distributor plate. Tighten the retaining screws. Set the control on the panel to the fully retarded position and then move it forward two notches. Make sure that the spring moves the distributor into the fully retarded position. Tighten the cable fixing screw. Operate the control and make sure that the distributor moves to the fully advanced and fully retarded positions.	
36	Connect accelerator control to the carburettor and adjust it (see Op. ID 142-4). Connect the choke control to the carburettor and adjust it. Check for satisfactory operation	8 mm box spanner
37	Connect the flexible fuel feed pipe to the pump.	
38	Insert the sheath of the clutch cable in its guide on the casing. Couple the cable to the relay lever. Fit the clutch fork control rod. Adjust the clutch control (see Op. ID 314-0)	12 mm spanner and box spanner
39	To fit the gear change control (see Pl. 59 and 60): a) Fit the connecting tube (1) on the control cable (3). Place the bracket (4) in position on the sidemember. Tighten the fixing screws .... b) With the control tube (5) in the gearbox cover in the neutral position, insert the seal (6) and fit coupling pin. c) Place flange (7) against the gearbox cover. Hold the flange and pull the sheath of the control cable to bring the key (8) into position. Fit the circlip (9) retaining the key.	12 mm box spanner

		TOOLS
	d) Put the connecting pipe (1) in position. Fit the spacing washers (10). Tighten the fixing screws of the flange (spring washers under the heads)	12 mm box spanner
	e) Fix the connecting tube (1) on the bracket (4) on the sidemember. The connecting pipe must be in perfect alignment with the axis of the control pipe (5) on the gearbox cover	12 mm spanner and box spanner
	f) Couple the control rod (2) to the relay lever (11). Tighten the nut (spring washer)	12 mm box spanner
40	To adjust the gear change control (see Pl. 59 and 60): a) Adjust the control cable; manipulate the threaded sleeve (12) to obtain a measurement of "a" = 17.5 ± 0.5 mm at the change speed lever. Tighten locknut (13)	17-21 mm spanners
	b) To adjust the control rod: Place the change speed lever in a position so that to the selector there is a dimension of "b" = 39.5 mm. With the control pipe on the cover in the neutral position move the rod (14) until the hole is exactly opposite the hole of lever (11) on the connecting tube (1). Position the spindle and tighten the nut (spring washer)	12 mm spanner
	c) Make sure that the dimension "b" does not vary. Check the change speed lever operation.	
41	Connect the speedometer cable to the gearbox	10 mm box spanner
42	To fit the steering gear (see Pl. 90 and 93) : a) Position the steering pinion so that the reference mark made when dismantling corresponds (paint mark opposite the slot in the flexible coupling at "a"). Engage the steering pinion in the flexible coupling. Fit the coupling screw (2) and tighten the nut	12 mm box spanner
	b) Place steering gear in its bearings, in accordance with reference mark (at "b") painted on when dismantling. Screw up the bearing cap fixing screws (spring washers under heads).	
	c) Couple the levers (1) to steering relays. (With nuts of the screws towards the inside)	14-16 mm box spanners
	d) After removing the cover of the gear change support bracket, compress the spring (3) (see Pl.91) (spring compressor 1991-T, see Pl.91, fig.1). When the coils of the spring are touching, tighten the screw (4) on the collar (5) (spanner 1994-T, see Pl.91, fig.3). Make sure there is no play by alternately pushing and pulling on the steering wheel	Compressor 1991-T Spanner 1994-T
	e) Fit cover of gear change support bracket. Tighten fixing screws (cup washers under heads).	
	f) Rotate steering wheel and tighten bearing cap fixing screws	12 mm box spanner
43	To fit radiator : Put the rubber blocks in the recesses on the front engine bracket crossmember. Hold radiator in position and couple the hoses to the radiator and to the water pump.	

		TOOLS
	Place the exhaust downpipe support in position. Insert spacer under fixing bracket on radiator side. Insert the radiator and bracket fixing screws without tightening them (spring washers under heads). Centre radiator so that the fan blades do not touch the cowling. Tighten the radiator and the exhaust pipe bracket fixing screws. . Fit the radiator tie-bar (plain and spring washers). Connect the flexible air pipe. Fit Ligarex collar (pliers 2483-T, see Pl. 17, fig. 2)	8-12-14 mm box spanners Pliers 2483-T
44	Fit the exhaust downpipe. Fit flanges and tighten the nuts (spring washers). Fit fixing collar of the pipe to the bracket and tighten the nuts (plain and spring washers)	12 mm box spanner
45	Mount battery support, insert distance piece between battery support and cross support of gearbox. Tighten the fixing screws (plain and spring washers)	12 mm box spanner
46	Couple the pipes, for the return of fluid, to reservoir. Fit clips with a rubber ring under each clip.	
47	Place the fluid reservoir in position and secure with clips. Connect feed tube to the H. P. pump; insert a rubber ring under each clip	8 mm box spanner
48	Fit front suspension spheres. Screw them down by hand. Check that the spacer is present on the left-hand side sphere.	
49	Connect cables from the dynamo to the regulator. Fit the battery tray, battery and battery cover. Mount the rear tie-rod fitted with the starter solenoid. Connect the terminal to the battery. Connect the earth lead. Connect the starter cable	12-14 mm box spanners
50	Set the ignition timing (see Op. ID 211-0).	
51	Fill the cooling system. During this operation, disconnect the heating hose from inlet manifold in order to release air from engine.	
52	Fill the suspension system. Disconnect the feed pipe for the high pressure pump from the fluid reservoir. Fill the fluid pump through the feed pipe. Couple the feed pipe to the outlet pipe on the reservoir. Fit an elastic ring on the pipe and tighten the clip.	
53	Check engine oil level.	
54	Loosen the bleed screw on the pressure regulator. Switch on the engine and let it run for a few minutes. Tighten the bleed screw. Put the systems under pressure. Check the unions and joints for leakage	8 mm spanner
55	With the engine running, check the levels of the radiator and of the fluid reservoir. Top up if necessary.	

		TOOLS
56	Bleed brakes (see Op.ID.453-0).	
57	Fit front brake cooling ducts, the air deflector plate, the front wings, the support bar, the front wheels, tighten the wheel screws to 108 to 144 ft.lbs (15 to 20 m.kg)	12-14 mm box spanners
58	Replace the spare wheel. Remove the bonnet retaining bar. Lower the car to ground (jacking support 2505-T, see Pl.111)	Jacking support 2505-T

STRIPPING AND ASSEMBLING (for replacing the engine)

	TOOLS
Place the engine-gearbox assembly on a stand (stand 2497-T, see Pl.19)	Stand 2497-T
Remove the dynamo tie-rod. Remove the dynamo; remove the rear fixing screw and undo the front fixing screw; remove the dynamo and water pump driving belts. Undo starter nose reaction screws	12-14 mm spanners and box spanners
Disconnect bracket for the front brake connection pipe from the water pump	12 mm box spanner
4 Disconnect the gearbox from the engine (spanners 1677-T, see Pl.54, fig.4 and 2431-T, see Pl.61, fig.1)	Spanners 1677-T and 2431-T
IMPORTANT NOTE: Do not roll the gearbox on the brake discs.	
5 To strip engine:	
a) Drain the engine (oil and water).	
b) Remove the air cleaner and the pipe assembly	12-17 mm box Spanners
c) Remove the water pump hoses. Remove the water pump. Remove the water pump cover	12 mm spanner and box spanner
d) Remove the carburettor; disconnect the flexible fuel feed pipe and vacuum pipe (spanner 1647-T, see Pl.16, fig.3)	14-17 mm box spanner 1645-T Spanner
e) Remove fuel pump	14 mm box spanner
f) Remove pipe connecting pump and control valve (spanner 2220-T, see Pl.61, fig.3) and seal the pipe and the pressure control valve openings (see Pl.89)	Spanner 2220-T
g) Remove the high pressure pump and the distance piece	12 mm box spanner
h) Remove the pressure control valve unit and its intermediate support	12 mm box spanner
i) Remove the crankcase breather	12 mm box spanner
j) Remove the inlet manifold	12 mm box spanner
k) Remove the dipstick and support tube	12 mm box spanner
l) Disconnect the sparking plug leads and remove the distributor	12 mm box spanner
m) Remove the steel water outlet pipe and shield closing plate from the cylinder head	12 mm box spanner
n) Remove the exhaust pipe and the screen fixing brackets	12 mm box spanner
o) Remove the starter motor	14-17 mm box spanners
p) Remove the sparking plugs (spanner 1603-T, see Pl.16, fig.4)	Spanner 1603-T
q) Disengage the gearbox locating dowels from the engine crankcase	

		TOOLS
	To Assemble.	
6	To fit the distributor :	
	Put the distributor in position. Move the distributor driving dog until it coincides with that of the oil pump.	
	Fit the metal fixing plate of the housing and tighten fixing screws (spring washer under head)	12 mm box spanner
7	Fit the dipstick support tube and the dipstick. Insert the earth lead terminal of contact breaker under the tube fixing bracket. Tighten the screw (plain and spring washer under head). Hook the distributor return spring to the tube fixing bracket	12 mm box spanner
8	Fit the crankcase breather, inserting a paper gasket. Tighten the fixing screws (spring washer under head)	12 mm box spanner
9	Fit the petrol pump, inserting cork gasket. Tighten the fixing nuts (spring washer)	14 mm box spanner
10	a) Fit the inlet manifold, inserting a gasket. Tighten fixing screws (plain washer under head)	12 mm box spanner
	b) Fit carburettor, inserting a fibre gasket. Tighten nuts (spanner 1645-T, see Pl. 16, fig. 3)	Spanner 1645-T
	c) Connect the flexible petrol feed pipe to the carburettor.	
	d) Connect the vacuum pipe to the distributor and the carburettor.	
11	Fit and adjust the position of high pressure pump (see Op. ID 111-0).	
12	a) Fit the pressure regulator and its intermediate support. Fit the fixing screws without tightening them (spring washers under heads).	
	b) Fit the pipe connecting the pump and the control valve. Tighten unions (spanner 2220-T, see Pl. 61, fig. 3)	Spanner 2220-T
	c) Tighten intermediate support fixing screws. Fit only the 2nd type support, reinforced with 2 welded plates.	12 mm box spanner
13	Fit the steel water outlet pipe on the cylinder head. Insert the gasket sealed with "hermetic". Tighten the fixing screws (plain washers under heads) and insert the screen locking plate	12 mm box spanner
14	Fit the exhaust pipe, inserting gaskets. Fit the bracket for fixing the screen (longest at the front). Tighten all the nuts progressively (spring washers)	12 mm box spanner
15	Fit the starter. Tighten the fixing screw and locknut	14-17 mm box spanners

		TOOLS
16	Fit water pump cover (insert gasket sealed with "hermetic"). Tighten the fixing screws and nuts (plain washers under nuts). Fit the water pump (insert gasket sealed with "hermetic"). Tighten the fixing screws and nuts. Fit the water pump hoses	14-17 mm box spanners 12 mm spanner and box spanner
17	Fit the air filter and tube assembly. Tighten fixing nuts (spring washers)	12-17 mm box spanners
18	Fit the sparking plugs and caps. Connect leads (spanner 1603-T, see Pl. 16, fig. 4)	Spanner 1603-T
19	To connect gearbox to engine : a) Insert the locating dowels fitted with their circlips in their seating on crankcase. b) Smear "hermetic" sealing liquid on the surface of the clutch housing bearing on the crankcase in the zone around the oil thrower. c) Fit the gearbox by turning the mainshaft by means of the starter relay. Also rotate the driving pulley to facilitate engagement of the splines. d) Tighten the fixing screws (spanner 1677-T, see Pl. 54, fig. 4, and spanner 2431-T, see Pl. 61, fig. 1)......	Spanners 1677-T and 2431-T
20	Connect to the water pump the retaining bracket for the pipe connecting the front brakes	12 mm box spanner
21	Put the belt in position. Fit the dynamo and the tie-rod; tighten the fixing screws and nuts (plain and spring washers).	12-14 mm spanners and box spanners
22	Fit the starter nose contact screws; tighten moderately. Tighten locknuts	12 mm spanner
	STRIPPING AND ASSEMBLING (to replace the gearbox)	
23	Remove the expansion chamber support. Store carefully the spacer for the left-hand bracket.	
24	Remove the water hoses, from the water pump cover and the steel pipe. Remove the radiator tie-bar and the radiator.	8-12-14 mm box spanner
25	Remove the dynamo tie-bar and withdraw the dynamo	12-14 mm spanners and box spanners
26	Remove the lower nuts of the brake unit supports. Remove the screws fixing the crossmember on the gearbox support brackets (turn down the locktabs) and release the crossmember	21 mm box spanner 14 mm spanner and box spanner
27	Removing the brake units : a) Remove the adjusting nuts, release the cable cover stops and withdraw the connecting cable from the right	12 mm spanner and box spanner
	b) Remove the screws securing the rear brake unit supports	14-19 mm box spanners
	c) Disconnect the feed pipes from the brake units (spanner 2219-T or 2221-T, see Pl. 72, fig. 4) and withdraw the brake units. If necessary, remove a brake shoe (lever 2127-T and fork 2128-T, see Pl. 143)................	Spanner 2219-T or 2221-T Lever 2127-T Fork 2128-T

		TOOLS
28	Remove the screw fixing the driving pulley. Withdraw the pulley, the key and the pulley adjusting washers. Remove the dynamo belt	14 mm box spanner
29	Slacken the locknuts and unscrew the screws securing the bendix housing of the starter	12 mm box spanner
30	Disconnect the control rod from the clutch control fork and remove the control rod, the lever and its shouldered washer and the control cable	12 mm spanner and box spanner
31	Remove the screws securing the clutch housing (spanner 1677-T, see Pl. 65, fig. 4 and spanner 2431-T, see Pl. 72, fig. 1) and disengage the gearbox from the engine. Leave it in position on the support trolley (support 2497-T, see Pl. 19) for this operation	Spanners 1677-T and 2431-T Support 2497-T
	Assembly.	
32	Fit the driving pulley and place the dynamo belt into position. Align the pulley (see Op. ID 231-0)	14 mm box spanner
33	Connect the gearbox to the engine :	
	a) Make sure that the gearbox locating dowels (fitted with circlips) are in position in the crankcase.	
	b) Insert the gearbox (resting on its trolley) by revolving the clutch shaft by means of the starting handle. Also rotate the drive pulley to permit engagement of the splines.	
	c) Tighten the screws securing the clutch housing (spanner 1677-T, see Pl. 65, fig. 4 and spanner 2431-T, see Pl. 72, fig. 1)	Spanners 1677-T and 2431-T
34	Fit the clutch control lever, with its shouldered washer. Connect the control rod to the clutch fork	12 mm box spanner
35	Fitting the brake units :	
	a) Mount the brake units fitted with their rear support. Tighten the support fixing screws and place a steel wire between the two top screws, to prevent unscrewing	14-19 mm box spanners
	b) Connect the feed pipes, to the brake units (spanner 2219-T or spanner 2221-T, see Pl. 72, fig. 4)	Spanners 2219-T or 2221-T
	c) Fit the connecting cable; pull the central portion back, to place the cable sheath stops in position. Connect the cable to the brake levers and fit the adjusting nuts.	
36	Fit the dynamo :	
	a) Fit the dynamo and secure it with the fixing screws (plain and spring washers). Fit the dynamo belt	14 mm spanner and box spanner
	b) Fit the dynamo tie-bar. Screw the fixing nuts, without tightening (plain and spring washers)	12 mm spanner and box spanner
	c) Align the pulley (see Op. ID 231-0) *(cars produced since May 1959).*	

NOTE - The crossmember, radiator and expansion chamber support should be fitted after the gearbox has been mounted on the car.

PARTICULAR POINTS

Dismantling

11 *When dismantling the crankshaft-connecting rod-piston assembly, ensure that the central main bearing cap is marked so that it can be refitted correctly. If the crankshaft and bearings are to be re-used, make a reference mark on the central and rear bearing shells so that they are not reversed on assembly.*

16 *Do not remove the small end bushes.*

17 *As the cylinder head is made of aluminium, the sparking plug wells and valve seatings cannot be replaced without special tools.*

Valve guides can be replaced (see Op.ID 112–3).

If a thread is damaged or stripped, it can be replaced by a "Heli-Coil" thread (see note MR–4279).

Assembly

23 *Valve spring calibration:*

Outer springs: L = 37 mm. under load of 24·200 ± 1·350 kg and
L = 28·5 mm. under load of 52 ± 2·800 kg.

Inner springs: L = 25·5 mm. under load of 5·250 ± 0·300 kg and
L = 16 mm. under load of 11 ± 0·600 kg.

Do not fit the rubber sealing ring on the exhaust valves.

24 *Check the oil pump on a test bench:*

Pressure = 3·5 kg/cm² (50 lbs/in²), oil SAE 20 st 60°C, the pump outlet through a 2·8 mm. diameter jet at 1,000 r.p.m.

25 *Replacing the starter gear ring: to fit, heat the bore of the starter gear ring to a temperature of 200 to 250°C (straw colour), do not exceed the temperature.*

26 *If the clutch bearing face "a" has been ground, remove the same amount from the bearing face "b" of the clutch casing (see Pl.42).*

27 *Checking crankshaft parts:*

The tightening torsion of the bearing cap screws is 58 ft.lbs (8m.kg), admissible clearance 0·06 mm. max. between crankshaft and bearings.

The tightening torsion of the connecting rod bearing cap screws is 36 ft. lbs (5 m.kg), admissible clearance 0·06 mm. max. between the crankshaft and the connecting rod bearings.

Note the reference marks made when dismantling the bearings and caps.

29 *Fitting the pistons: heat the pistons to a temperature of 60 C (oil bath or furnace) to fit the gudgeon pins; note the order of assembly and do not interchange the gudgeon pins, as they are weighed and selectively assembled with the pistons.*

31 *Tightening torsion of the connecting rod screws = 36 ft./lbs (5 m.kg). This torque is to be strictly adhered to.*

32 *Tightening torsion of the screws for the rear thrust plate of the camshaft = 7·5 ft.lbs (1 m.kg) (lockwashers).*

33 *Fitting cylinder barrels: no height adjustment, 1 paper gasket only fitted dry.*

Cylinder head gasket: Smear it with boiled linseed oil, the crimping towards the barrels; new type of gaskets are fitted dry, the varnished surface towards the cylinder head.

34 *Fitting the cylinder head: 1st tightening torsion 21·75 ft.lbs (3 m.kg), 2nd tightening torsion 43·5 ft.lbs (6 m.kg). Observe the torque loading and the tightening sequence of the screws indicated on Pl.7.*

Check the cylinder bores: deformation or ovality 0·03 mm. max., except for a distance of 20 mm. from the bottom of the bore: 0·05 mm. max.

35 *Oil seals: fit the crankshaft by placing a shim steel strip (L 200. l 10, thickness 0·1 mm.) around the oil thrower and tighten the bearing screws. Remove the main bearing cap and withdraw the shim steel strip. Reassemble.*
Tightening torsion of the main bearing cap screws = 72 ft.lbs (10 m.kg).

36 *Crankshaft end float 0·03 to 0·09 mm., adjusted by means of shims placed between the end of the bearing and the timing gear pinion.*

37 *Timing gear: align the reference marks (punch marks): the line joining them must pass through the centre line of the pinions.*

Tightening torsion of nuts: camshaft = 108 ft.lbs (15 m.kg) and crankshaft = 144 ft.lbs (20 m.kg).

38 *Fitting the oil pump (tightening torsion) : Pump fixing screw — 11 ft.lbs (1·5 m.kg) max and locknut - 22 ft.lbs (3 m.kg).*

Pipe unions = 43 ft.lbs (6 m.kg) and locknuts = 29 ft.lbs (4 m.kg).

40 *Fitting timing cover: liquid Hermetic or Festinol on the face of the bearing cap which touches the timing cover gasket.*

Brass washer under the heads or Hermetic (new screws with circular shoulders), for the three screws projecting inside the timing cover.

Tightening torsion — 11 ft.lbs (1·5 m.kg).

Fitting sump cover : a paper gasket is no longer fitted between the sump cover and the crankcase. Smear the jointing surface with very liquid Hermetic.

41 *Engine flywheel : Tightening torsion of the screws — 36 ft.lbs (5 m.kg) (no lockwasher).*

42 *Clutch: tightening torsion of screws = 15 ft.lbs (2 m.kg) (spring washers).*

44 *Adjustment of valves : clearance = 0·008" (0·20 mm) inlet and 0·010" (0·25 mm) exhaust.*

Adjust the valves of a cylinder with the piston at T.D.C. (end of compression stroke), the valves on the opposite cylinder being on the point of balance : 1st cylinder with 4th cylinder valves balanced, 3rd cylinder with the 2nd cylinder valves balanced, 4th cylinder with 1st cylinder valves balanced, 2nd cylinder with 3rd cylinder valves balanced.

	DISMANTLING (see Pl. 1).	TOOLS
1	Place the engine on a suitable stand or on a work bench.	
2	Remove the cylinder head lubrication pipe	12-17 mm box spanners
3	Remove the side engine mounting arms	14-17 mm box spanners
4	Remove the clutch and flywheel. Disengage the bearings from flywheel	12 mm box spanner
5	Remove cylinder head cover. Remove the pressed steel cups (1) and the rubber seals (2) from spark plug holes ..	12 mm box spanner
6	To remove the cylinder head :	
	a) Undo fixing screws (3) of the inlet rocker assembly without removing them from the brackets (4). Remove the assembly with the screws in place in order to keep the parts in their correct position	14 mm box spanner
	b) Remove the exhaust rocker assembly and brackets. Remove the rocker push-rods	12 mm box spanner
	c) Remove the cylinder head fixing screws, right-hand side. Remove the cylinder head, cylinder head gasket and locating dowels	14 mm box spanner
7	Remove the tappets.	
	Turn the engine over and rest it on the face for the cylinder head.	

		TOOLS
8	Remove the sump and the timing gear cover	12 mm box spanner
9	Remove the oil pump	14-16-17-26 mm spanners
10	Remove the timing chain and pinion assembly (spanners 1667-T and 1731-T, see Pl. 15, fig. 1 and 3).	
	When undoing the nuts, wedge pinions with setting gauge 1680-T (see Pl. 15, fig. 2); if not available, insert wooden wedge between one of the crank pins and the crankcase.	
	Disengage the keys, the steel washer (5), the bearing thrust ring (6), and the adjusting shims (7)	Spanners 1667-T and 1731-T Setting gauge 1680-T
11	To remove the crankshaft, connecting rod and piston assembly (see Pl. 14):	
	a) Remove the assembly screws (8) from the crankshaft oil seals (9) and (10).	
	b) Remove the fixing screws from the bearing caps. Remove the bearing caps (make sure that the direction of assembly is clearly marked).	
	NOTE - If the crankshaft and the bearings are to be re-used, make a reference mark on the centre and rear half-bearings, which are of the same size, so that they are not reversed on assembling.	
	c) Remove the crankshaft, connecting rod and piston assembly. Remove the crankshaft bearing thrust ring (11) (see Pl. 1).	
12	Remove the upper section of crankshaft oil seal (9)	12 mm box spanner
13	Remove the camshaft (see Pl. 1).	
	Remove the thrust plate (12) and disengage shaft from crankcase	12 mm box spanner
14	To strip the cylinder block (see Pl. 1) :	
	a) Remove the timing chain lubricator (13), oil circulation plugs and water drain plugs	5-12 mm spanners 21-23 mm box spanners
	b) Remove the pressure regulator bracket	12-17 mm box spanners
	c) Remove the cylinder barrels.	
	d) Remove the tapered oil circulation union from the cylinder block.	
15	To strip the crankshaft :	
	Remove connecting rod caps and connecting rods (make sure that the parts are marked) (socket 1624-T, see Pl. 16, fig. 6).	
	Mark the bearings if they are to be re-used	Socket 1624-T
16	To remove the pistons from the connecting rods :	
	a) Remove the gudgeon pin circlips from the groove in the piston.	
	b) Heat the pistons to a temperature of about 60°C by immersion in an oil-bath or by heating in oven.	

c) Remove the gudgeon pins. Do not mix them up since they are weighed and paired with the respective pistons.

NOTE - It is inadvisable to remove the small end bushes. The machining and tolerances are of such high precision that this delicate work cannot be carried out with the normal tools.

17 To strip the cylinder head (see Pl.3):
Remove the valves (spring compressor 1614-T and support and base assembly 1616-T, see Pl.5).
Remove side sealing plates.

NOTE - As the cylinder head is of aluminium, the sparking plug wells and valve seatings cannot be replaced without special tools. Nevertheless, in certain cases, the valve guides can be replaced (see Op. ID.112-3, paragraphs 2 to 4).

Do not remove the studs . . . .

TOOLS

Spring compressor 1614-T
Support and base assembly 1616-T
12 mm box spanner

18 To strip the oil pump (see Pl.10):
Remove the delivery pipe and remove the tapered union.
Remove the filters (14).
Remove the pump base (15) and the idler pinion (16)
Withdraw the driving pinion (17) (extractor 1964-T, see Pl.10 fig.4)
Do not use the dowel; insert a cylindrical pressure pad 12 mm dia. x 40 mm long between the extractor screw and the pump shaft
Release the shaft assembly (18) and the pinion (19) from the pump body. Move the fixed pinion on the shaft, release the split retaining ring (20) and take off the pinion and key from the shaft.
Remove the positioning screws (21) of the tube support (22) and remove the tube.
Drive out the spindle (23) from the idler pinion.
Remove the spring bearing plate (24), the spring (25) and the piston (26) from the discharge valve.
Remove the bush (27) from the tube support (22) with the aid of a mandrel 15 mm dia. x 250 mm long . . . .

14-26 mm spanners
12 mm box spanner
Extractor 1964-T
Pressure pad 12 mm dia. x 40 mm long
14 mm spanner and box spanner
Mandrel 15 mm dia. x 250 mm long

19 Dismantle the water pump (see Op.ID 231-3).
20 Strip the inlet rocker shaft assembly.
21 Clean the parts.
22 With spray gun paint the inside of the engine crankcase. Use a paint resisting the action of hot oil (paint such as AC.8, sold by CLEMENT & RIVIERE or MOUQUET).

TOOLS

ASSEMBLY

23 To prepare the cylinder head (see Pl.4):

a) Grind the cylinder head:

A distortion of 0.05 mm is tolerated during manufacture.
Moderate grinding of the joint face is allowed. The original thickness of the cylinder head must not be reduced by more than 0.3 mm.
If it is suspected that the cylinder has already been ground, measure dimension "c" (see fig.6). This dimension "c" must be $26.5^{+0.1}_{-0.2}$ mm.

b) Grind the valves (Black & Decker type valve grinder).
NOTE - The valve face angles are:
Exhaust valves 90°
Inlet valves 120°
Round corners of the valve heads at "a" and "b" (see Pl.4 fig.3). The radius of curvature should be about 0.5 mm.

c) Grind the valve seats:
NOTE - The width "l" of the seat must be between 0.9 and 1.5 mm. Use the following grinding wheels to obtain these dimensions:

Inlet valve seat:
For the valve seat face .... 120° biconical wheel 1662-T
For top clearance .... 150° biconical wheel 1630-T
For bottom clearance .... 90° biconical wheel 1630-T

Exhaust valve seat:
For the face .... 90° biconical wheel 1627-T
For top clearance .... 150° biconical wheel 1627-T
For bottom clearance .... 60° wheel 1633-T

It is essential that the large diameter of the seat face should be equal to the greatest diameter of the valve (see figs 1 and 2) ....

Wheels 1662-T
1630-T
1627-T
1633-T

d) Grinding in the valves (suction valve grinder 1615-T, see fig.4) driven by an electric, pneumatic or hand operated grinder ....

Valve grinding tool 1615-T

e) Clean the cylinder head carefully in order to remove all traces of carborundum from the valve chambers and gas passages.

f) Calibrate the springs (spring calibrator 2420-T, see Pl.6) ....

Spring calibrator 2420-T

Spring Characteristics

	Outer spring			Inner spring	
	Length in mm	Load in kg		Length in mm	Load in kg
Calibration	37	24.2 ± 1.350	Calibration....	24.5	5.250 ± 0.300
Calibration	28.5	52 ± 2.800	Calibration....	16	11 ± 0.600

TOOLS

g) Fit the valves (spring compressor 1614-T and support and base assembly 1616-T, see Pl. 5). Oil valve stems and the face. Put the valves in position. Fit a sealing ring (30) on the inlet valve stems only (see Pl. 3, fig. 2).

For each valve fit (see fig. 3) :

One thrust washer (3) for the outer spring.
One shouldered thrust washer (32) for the inner spring.

Fit the inlet valve springs. Make sure that the split cotters retaining the cap are properly seated.

Fit the exhaust valve springs; fit the spring thrust cap, the split cotter locating cup and the split cotter ....

Spring compressor 1614-T
Support and base assembly 1616-T

NOTE - A sealing ring must not be fitted on the exhaust valves since when working the valve will rotate and destroy the ring.

h) Remove the filter on the cylinder head cover. Wash the filter element in petrol.
Blow with a jet of compressed air and then dip into engine oil.
Replace filter.

24 To refit oil pump (see Pl. 10) :

a) Fit the bush (27) into the support tube (22) in a press.

b) Insert the idler pinion spindle (23), in a press, mount the idler pinion (16) making sure that it turns freely. Place the fixed pinion (19) in the pump body and with a gauge and straight edge resting on the bearing face at the bottom of the pump, measure the pinion clearance. This clearance must not exceed 0.05 mm. Take out pinions.

c) Fit the support tube (22). Fit the fixed pinion (19) on the shaft (key and split ring (20) in position). Insert the shaft (18) in the body of the pump. Fit support tube set screw (21).

Tighten the nuts to 18 ft.lbs (2.5 m.kg), fit split pins ....

14 mm box spanner

d) Grease the entry side of the bore of the driving pinion and fit it on the shaft, in a press.

During this operation, the shaft should be supported on a cylindrical block. The pinion should not take any of the strain ....

Block 12 mm diameter
x 10 mm long

When pinion (17) is on spindle, an end float of between 0.3 and 0.1 mm must be left.
If the pinion is pushed down too far, hold the pinion in the hand and with the aid of a copper rod and hammer gently tap shaft until the pinion is in the correct position.

TOOLS

e) Fit the idler pinion (16), paper gasket and pump base (15) (with the filter support on the outlet pipe side). Tighten the screws to 9.4 ft.lbs (1.3 m.kg) (spring washers under heads). Make sure that the pinions do not bind, if so, fit a second paper joint at the pump base. Lock the milled-head screw by tapping the metal of the pump base into the screw groove ....

12 mm spanner and box spanner

f) Fit piston (26), spring (25) and valve spring retaining flange (24). Tighten screws (locking tabs under head)......

12 mm box spanner

g) On the intake opening fit: one cork seal, the top cover, the upper filter plate, a filter (large diameter hole), the distance piece, a second filter, the lower plate. Tighten the screws to 9.4 ft.lbs (1.3 m.kg). Tighten locknut ...

12 mm box spanner

h) Check the pressure on the test bench.

With SAE. 20 oil heated to 60 ± 5° C and the pump outlet through a jet of 2.8 mm diameter, the pressure must be 50 lbs. /square inch (3.5 kg/cm^2) at 1,000 r.p.m. (If this pressure is not reached, renew spring (25) (see Pl. 10).

NOTE - Failing a test bench use the simplified unit MR-1811 (see Pl. 11) ....

Test bench MR-1811

25 To replace the starter ring :

a) Detach the starter ring from the flywheel, driving it off with a hammer.

b) To fit the starter ring on the flywheel :

Heat the starter ring with a blow torch fitted with a nozzle of 800 to 1000 litres.

Heat only the bore, at the same time rotating the ring continuously to ensure uniform expansion. Cease heating when the ring reaches a temperature of 200° to 250°C (straw colour). Above this temperature the heat treatment of the ring will be modified. Make sure that the flywheel is perfectly clean and fit the ring quickly, ensuring that it is kept perfectly level.

26 Grind the bearing face for the clutch disc on the flywheel (see Pl. 38) :

Each time the clutch disc bearing face "a" is ground, remove the same amount from the bearing face "b" on the clutch housing. Effect these two operations without removing the flywheel from the lathe, so as to ensure that both machined faces are perfectly parallel.

Grinding must not exceed 0.3 to 0.5 mm. The distance between the bearing face of the crankshaft and the Ferodo disc must not be less than 15.4 mm.

27 Prepare the parts for the crankshaft (see Pl. 13) :

In general, proceed by renewing the parts.

Nevertheless, some repairs are possible :

a) Crankcase :

If the bearing caps have been filed by careless workmen, standard connecting rods cannot be fitted. Either a new cylinder block must be fitted or, failing this, the cylinder bearings must be rebored. Proceed as follows :

Check the bearing faces on a surface plate for flatness. If necessary, file them flat or, better still, mill them.

Place the bearing caps (without the bearings) on the cylinder block and tighten the screws to 58 ft.lbs (8 m.kg) (spanner 2471-T, see Pl. 7, fig. 2).

Measure the diameter "a" with a dial gauge (dial gauge 2440-T) (see Pl. 13, fig. 2).

Make sure that the measurement "a" taken at one end of the bearing is the same as the measurement "b" taken at the other end. If not, the bearing faces of the cap are not parallel to the centre line of the crankshaft, they must be corrected with a file or better still on a milling machine. The difference between the two measurements "a" and "b" must not exceed 0.01 mm.

Re-measure the diameter "a".

The difference between this diameter "a" and the original dimension ($58.01 +{}^{0.025}_{0}$ mm) represents the thickness "e" of the shims to be inserted between the caps and the cylinder block (see fig. 2) :

$$"e" = 58.01 +{}^{0.025}_{0} - a$$

The shims must be machined with the greatest precision and their faces must be parallel to within 0.01 mm.

Refit the caps without the bearings but insert the shims, tighten the screw to 58 ft.lbs (8 m.kg) and measure the distance "a". It must be $58.01 +{}^{0.025}_{0}$ mm. If not, remachine the shims.

We strongly advise the use of this method which, though apparently somewhat long, does allow the connecting rods sold by our Spare Parts Department to be fitted without modification. We strictly forbid any taking up of the clearance allowed for these assemblies. The clearance is measured with the greatest precision in the factory and cannot be altered without risk of damage ....

Dial gauge 2440-T
Torsion spanner 2471-T
17 mm socket

b) Crankshaft :

If necessary, a better surface finish of the bearings can be obtained by lapping them lightly, provided that the following maximum clearances are adhered to :

on the bearings : 0.06 mm.
on the connecting rods : 0.06 mm.

Using a micrometer, measure the diameter of the bearing faces; they should be:

on the crankpins : $54\,{}^{0}_{-0.015}$ mm or $53.5\,{}^{0}_{-0.015}$ mm.

on the connecting rod bearing faces : $48.01\,{}^{-0.01}_{-0.02}$ mm or $47.51\,{}^{-0.01}_{0.02}$ mm.

c) Connecting rods :

1. The connecting rod bearings can be replaced.
2. On engines produced until June 1957, all 4 connecting rods must be replaced together (thickness at the centre of the connecting rod body : 19 mm).
3. On engines produced since June 1957, connecting rods are interchangeable. It is possible to replace only one connecting rod (thickness at the centre of the connecting rod body : 22 mm).

28 To clean the crankshaft :

NOTE - The crankshaft must, in all circumstances, be cleaned as indicated below.

1. Remove the crank pin oilway plugs (spanner MR-3462-70, see Pl. 16, fig. 2) ....
2. Thoroughly clean the crank pin bores and the oilways in the journals. Make sure that the connecting rod lubricating holes in the crank pins are clean. Finally clean with petrol.
3. Fit the plugs, tightening them to 29 ft.lbs (4 m.kg). This torque is essential to prevent the plugs from becoming loose when the engine is running.

Spanner MR-3462-70

29 To fit the pistons on the connecting rods :

NOTE - 1. Certain pistons are marked at the top with an arrow and the word "FRONT".

TOOLS

2. The plane of assembly of the connecting rod cap and of the body is oblique. This must be adhered to when fitting (see Pl. 2).
3. To allow for the taper of the piston bores and of the gudgeon pin, one direction of assembly must be observed.
   The greatest bore diameter is marked with a grease pencil on the boss and the smallest pin diameter is marked in grease pencil on the end of the pin.

a) Place a gudgeon pin circlip on the side of boss not marked with the grease pencil.
b) Bring the pistons to a temperature of about 60°C either in an oil bath or by heating in an oven, so that the gudgeon pin (first coated with oil) can be inserted by hand (do not interchange the gudgeon pins; they are weighed and paired with their respective pistons).
c) Fit the other circlip and make sure that the circlips are seated properly in the grooves.

30 Insert the bearing in the flywheel bore :

When the circlip is in position in the flywheel, insert the bearing in its housing (use a tube) ....

Tube :
Internal dia. = 35 mm
External dia. = 41.5 mm

31 To fit the connecting rods to the crankshaft :

Oil the bearing faces with an oil-can (SAE. 20 engine oil). Do not use a brush as this is liable to cause the introduction of dirt or brush hairs.

Fit the half bearings in the rod and in the cap. Make sure that the lugs engage in the grooves. If the old bearings are to be used, make sure that they are fitted in accordance with the reference marks made when dismantling.

Fit the rods on the crankshaft (see Pl. 2 for positioning). Do not reverse the position of the cap on the rod.

Tighten the screws to 36 ft.lbs (5 m.kg) (socket 1624-T, see Pl. 16, fig. 6). This torque is essential ....

Torsion spanner 2471-T
Socket 1624-T

NOTE - The bearings are slightly narrower than the cap and the big end of the connecting rod. The cap is likewise narrower than the big end.

32 To fit the camshaft :

a) Fit the camshaft after first oiling the bearings.
   Tighten the screws of the thrust plate (12) to 7.5 ft.lbs (1 m.kg) and turn down the locking tabs ....

12 mm box spanner

b) Oil the tappets and insert them in the bores.

33 To fit cylinder barrels and cylinder head (see Pl. 12) :

NOTE - Because they are precision machined, the barrels can be fitted into their bores in the cylinder block without adjusting their heights, there is therefore only one type of paper gasket.

a) Make sure that the base of the barrel and the bearing face in the cylinder block are perfectly clean. Offer up the barrels to the cylinder block making sure that they do not tilt.
b) Place seal on cylinder barrel, so that its flat edge is parallel with the flat part of the barrel and with the reinforcement towards the barrel.
   By hand, work seal onto the cylinder barrel until it is as far as the first shoulder on the barrel at "a". Now use the hardboard washer to complete the operation. The washer is supplied in the packet of seals sold by our Spare Parts Department. Otherwise use plate MR-4134 (see Pl. 12, fig. 3) ....

Plate MR-4134

c) Place the cylinder barrels in the bores in the cylinder block. Make sure that they are correctly in position.

34 To fit the cylinder head. (see Pl. 3) :

a) Insert the cylinder head locating dowels in the bores in the cylinder block with the chamfer towards the cylinder head.

TOOLS

b) Place the cylinder head gasket in position, after smearing it with boiled linseed oil, the crimping towards the barrels. The latest types of gaskets (varnished) are fitted dry, the varnished face towards the cylinder head. Fit cylinder head making sure that no foreign matter is trapped between the cylinder head and gasket while this work is being carried out.

c) Fit the rocker pushrods in position (the exhaust pushrods are the longest).

d) To prepare the inlet rocker assembly (see Pl.3):

1. Dismantle the assembly
2. Drive out the plugs from the shaft with a punch passing through the fixing screw holes. Carefully clean the inside of the shaft with a metal pin, making sure that the lubricating holes of the inlet and exhaust shafts as well as those of the rockers and the shaft brackets are clean.
3. Fit the plugs and solder them to the assembly.
4. First oil the rocker shaft and then with the lubricating holes directed downwards and towards the valve, place on it the following, starting from the front:

   1 long screw (3) fitted with bearing cap (33) for securing the shaft,
   1 washer (37),
   1 spring (44),
   1 left hand rocker (34),
   1 washer (37),
   1 long screw fitted with bearing cap,
   1 washer
   1 right hand rocker (35),
   1 spring,
   1 washer,
   1 long screw fitted with bearing cap,
   1 long screw fitted with bearing cap,
   1 washer,
   1 spring,
   1 left hand rocker
   1 washer
   1 long screw fitted with bearing cap
   1 washer
   1 right hand rocker
   1 spring
   1 washer
   1 long screw fitted with bearing cap.

e) Put the rocker assembly supports (4) (inlet and exhaust) in position. Offer up the inlet rocker shaft. Insert the cylinder head fixing screws. During this operation make sure that the rocker push rods are properly located in the sockets in the adjusting screws.

f) Put the exhaust rockers in position (see Pl.3): 1st and 3rd cylinders: Starting at the front place the following parts on the rocker shaft (28): one spring (29), the rocker arm (38), one washer (37). 2nd and 4th cylinders: Starting at the front, place the following parts on the shaft (28): one washer (37), the rocker arm (36), 1 spring (29).

TOOLS

Fit these assemblies as they are made ready. The lubricating holes must be directed downwards. Put the caps (52) on the studs. Tighten the nuts ....

12 mm box spanner

g) Insert short cylinder head fixing screws. Screw up without tightening.

h) Tighten the screws in the order indicated (see Pl. 7), tightening on first occasion to 21.75 ft.lbs (3 m.kg) and to 43.5 ft.lbs (6 m.kg) on the second occasion.
The tightening torques are very important, do not exceed the torque of 43.5 ft.lbs (6 m.kg) (torsion spanner 2471-T, see Pl. 7, fig. 2).
Keep to the order given ....

Torsion spanner 2471-T
14 mm socket

NOTE - After the car has covered a distance of 500 km and then at 2000 km, tighten the cylinder head. Slacken the screws, then proceed as indicated in paragraph (h). The radiator must be drained in order to carry out this operation.

i) Turn over engine (stand MR-3053-170, see Pl. 18, fig. 1).
Check the barrel bores for deformations (dial gauge 2440-T for checking bores): deformation or ovality must not exceed 0.03 mm, except in the part 20 mm from the bottom where 0.05 mm is admissible ....

Dial gauge 2440-T
Stand MR-3053-170

35 To fit the crankshaft and the pistons in the cylinder block (see Pl. 13 and 14) :

a) From 0.10 mm shim steel cut out a piece 200 mm long and 10 mm wide.

b) Fit the top half bearing (9) on the cylinder block and the lower half bearing (10) on the bearing cap.
Insert the fixing screws (40) without tightening them (no washers under the heads).

c) Fit the main bearings making sure that the bores of the cylinder block are clean; oil with oil-can.

d) Oil the pistons. The gaps in the 1st and 3rd rings must be 180° diametrically opposite the gaps of the 2nd and 4th rings. Fit the ring clip on the pistons (ring clip 1656-T, see Pl. 13, fig. 1).
Mount the bearing thrust ring (6) (see Pl. 1) on the crankshaft with the chamfer towards the ground face of the crankshaft and the washer retaining slot towards the bearing cap.
Fit the crankshaft, guiding the pistons to avoid pinching and breaking the rings. Also ease the bearing thrust ring into position. Remove the piston ring clip.

e) Insert the shim steel strip (prepared according to paragraph "a") around the oil thrower on the crankshaft as shown in Pl. 14, fig. 1. Mount the crankshaft in its bearings.

f) Fit the bearing cap. Tighten the two assembly screws (8) of the half-shells. Tighten the bearing caps screws to 72 ft.lbs (10 m.kg) (torsion spanner 2471-T, see Pl. 7, fig. 2) ....

8 mm box spanner
Torsion spanner 2471-T
17 mm socket

NOTE - Do not turn the crankshaft when centring the half-shells.

g) Tighten the half-shell fixing screws (40) alternately, up to 9.5 ft.lbs (1.3 m.kg).

h) Remove the half-shell assembly screws (8). Remove the bearing cap. Lift the crankshaft in order to remove the shim steel strip.

i) Smear the mating faces of the half-shells with "hermetic".
Place bearing caps complete with bearings in position. Fit sump gaskets making sure that the ends of the gaskets are well under the front and rear bearing caps. Smear these areas with "hermetic". Tighten the bearing screws to 72 ft.lbs (10 m.kg) (torsion spanner 2471-T, see Pl. 7, fig. 2).

TOOLS

There are no lockwashers under the screw heads.

Replace and tighten the half-shell assembly screws (8) .... Torsion spanner 2471-T

IMPORTANT NOTE - Do not turn the crankshaft after it has been fitted. The valves are not under control and if one of them is raised, the piston of the corresponding cylinder would not be able to pass the T.D.C. without fouling the valve.

NOTE - Festinol is sold by Ripolin.

36 To adjust the end float of the crankshaft (see Pl. 1) :

a) Fit a bearing thrust ring (6) with the groove engaged on the retaining pin, an adjusting shim (7) 0.05 mm thick, the thrust washer (5), the crankshaft pinion (temporarily without the key), tighten the nut (39) (spanner 1667-T, see Pl. 15, fig. 1).

Push the crankshaft towards the bearing on the timing side by means of a lever or a wedge placed between a crankshaft throw and the crankcase.

b) Measure the clearance between the bearing cheek (6) and the thrust washer (5) (at "j").
This clearance must be between 0.03 and 0.09 mm. Choose from among the shims sold by our Spare Parts Department, those which give this clearance.

c) Remove the pinion .... Spanner 1667-T

37 To fit the timing gear:

a) Fit the timing chain lubricator (13) with the hole on the centre line of the crankshaft; tighten to 7.5 ft.lbs (1 m.kg) and the locknut to 10 ft.lbs (1.4 m.kg).

Fit the oil-way plugs:

b) Put the two pinions for the crankshaft and camshaft on the workbench.
Align the two reference marks: a line passing through the centre line of the two pinions must pass through the reference mark (punch mark on one tooth) of the camshaft pinion and through the gap between the teeth which were marked with a punch (see Pl. 15, fig. 2). One should also use the setting gauge 1680-T, (see Pl. 15, fig. 2). This instrument has a centre line marked on it to enable the reference marks to be aligned.

c) Fit the chain and pinion assembly. Without moving the pinions, place it in position; turn the camshaft by means of the pinion so that the keyways of the pinions and of the shafts are opposite one another.

d) Fit the chain and pinion assembly making sure that the keys are properly located on the camshaft and on the crankshaft. Tighten the camshaft nut to 108 ft.lbs (15 m.kg) (spanner 1731-T, see Pl. 15, fig. 3) and that of the crankshaft to 144 ft.lbs (20 m.kg) (spanner 1667-T, see Pl. 15, fig. 1), wedging the crankshaft by means of a wedge inserted between a crankshaft throw and the crankcase, or with the aid of the setting gauge 1680-T.
Turn down the locking tabs on the nuts .... 21-23 mm box spanners
Setting gauge 1680-T
Spanner 1731-T
Spanner 1667-T

38 To fit the oil pump :

a) Bring the crankshaft to the T.D.C. of the 1st cylinder (end of compression stroke).

b) Engage the oil pump so that the driving groove is parallel to the centre line of the engine, with the small side towards the interior of the engine after it has been placed in position. Tighten the pointed screw to 11 ft.lbs maximum (1.5 m.kg) to avoid crushing the tube and tighten the locknut to 22 ft.lbs (3 m.kg) .... 17 mm spanner

c) Fit the tapered unions on the cylinder block and the pump body.
Fit the oil piping between pump and cylinder block, tighten the union nuts to 43 ft.lbs (6 m.kg) and the locknuts to 29 ft.lbs (4 m.kg) .... 14-26 mm spanners

		TOOLS
39	Fit the pressure regulator bracket. Tighten the fixing screws (plain and spring washers under heads). Only use the latest type bracket reinforced with two steel plates	12-17 mm box spanners
40	To fit the sump and timing cover : a) In the bearing grooves place : at the front : cork gasket (first smear the ends with "hermetic"). at the rear : the cork gasket (the ends of which should be smeared with "hermetic") and the cap groove sealing plate. Smear the gaskets with "hermetic", especially in the corners. Fit the sump. Tighten the sump screws. No washers should be fitted under the heads of the screws. *A paper gasket is no longer fitted between the sump and the crankcase.* Smear the joint face of the crankcase with *very liquid* "hermetic". The longest screws are for the front and rear bearings	7 mm tee spanner 12 mm socket
	b) Fit the timing cover, inserting a paper gasket. Smear very liquid "hermetic" or "Festinol" on the joint face of the crankcase. Fit a brass washer under the heads of the three screws projecting on the inside of the timing cover, or smear the underside of the heads with "hermetic" (new screws have a collar). Tighten the screws to 11 ft. lbs (1.5 m. kg)	12 mm box spanner
41	Fit the flywheel, tighten the screws to 36 ft. lbs (5 m. kg) (torsion spanner 2471-T, see Pl. 7, fig. 2). No lock-washers under the screw heads	Torsion spanner 2471-T 17 mm socket
42	To couple the clutch to the flywheel : a) Make sure that the clutch disc bearing faces on the flywheel and the clutch are clean. b) Couple the clutch to the flywheel, using a mandrel (mandrel 1712-T, see Pl. 40, fig. 4) or a primary shaft to centre the disc. When tightening, make sure that the mandrel slides freely, thus indicating that the plate has been properly centred. Tighten screws to $14 +^{2}_{0}$ ft. lbs ($2 +^{0.250}_{0}$ m. kg) (spring washers under heads). Withdraw mandrel	Mandrel 1712-T 12 mm box spanner
43	Turn engine over. Support it on a stand (stand MR-3053-160, see Pl. 18, fig. 2).	
44	Adjust valve clearances. The clearance must be .008 ins. (0.20 mm) for inlet valves and .010 ins. (0.25mm) for exhaust valves. Adjust the valves of a cylinder with the piston at T. D. C. - end of compression stroke. The valves of an opposite cylinder are then at point of balance, i. e. the inlet valve at the commencement of admission and the exhaust valve at the end of exhaust). Adjust valves of : 1st cylinder, the valves of 4th cylinder being at point of balance. 3rd cylinder, the valves of 2nd cylinder being at point of balance. 4th cylinder, the valves of 1st cylinder being at point of balance. 2nd cylinder, the valves of 3rd cylinder being at point of balance..........	Support MR-3053-160

		TOOLS
45	Oil the valve springs and the rocker sockets. Put the metal caps (1) and the seals (2) in position in the sparking plug tubes. Fit the cylinder head cover, sticking the gasket to the cover with "Hermetic".	
	Tighten the nuts (leather and plain washers)	12 mm box spanner
46	Fit the engine mounting side arms (spring washer under screw head)	14-17 mm box spanners
47	Fit the cylinder head lubricating tube, using *a double copper gasket* when securing to the cylinder head and *2 copper gaskets* when securing it to the crankcase. *Tighten the screw on the cylinder head to a tightening torque of 11 ft. lbs. (1.5 m. kg) and the screw on the crankcase to 18 to 23·3 ft. lbs. (2·5 to 3·2 m.kg). Do not exceed this tightening torsion.* NOTE - Never fit fibre gaskets where the lubricating tube is joined to the crankcase.	
48	Paint the unit.	

PARTICULAR POINTS

Replacement of the sump.

Remove the engine–gearbox assembly and leave suspended from a pulley block for this operation (see Op. ID 100–1).

When fitting, cut the old gasket at the level of the bearing cap, using a sharp blade. Smear the joint face with very liquid hermetic. Do not fit a paper gasket.

Replacement of the oil seals.

Fitting:
Do not turn the crankshaft during this operation (important).
Insert a shim steel strip (L = 200, l = 10, thickness = 0·1 mm) around the oil thrower on the crankshaft.
Fit the oil seals and the rear bearing cap (tighten the screws to 72 ft. lbs. (10 m.k.g). Tighten the assembly screws of the oil seals.
Tighten the oil seal fixing screws and loosen the assembly screws. Remove the bearing cap and disengage the steel shim.
Smear the assembly faces of the oil seals with "Hermetic" and refit (tighten the bearings to 72 ft. lbs. (10 m.k.g.)
Adjust the crankshaft end float which should be 0·03 to 0·09 mm.

REPLACEMENT OF THE SUMP

		TOOLS
	To remove.	
1	Remove the engine-gearbox assembly (see Op. ID 100-1, paragraphs 1 to 25).	
2	Leave the engine-gearbox assembly suspended from the pulley block. Drain the oil from the engine	21 mm box spanner
3	Remove the fixing nuts and screws from the sump, disengage sump. Avoid damaging the gaskets between sump and cylinder block	12 mm socket with extension
4	Remove the cork gaskets from the front and rear bearing caps. Carefully clean the grooves in the bearing caps.	
	To refit.	
5	Place the cork gaskets on the bearing caps : at front, use one cork gasket, the ends of which must be smeared with "Hermetic"; at the rear, use a cork gasket, the ends of which must be smeared with "Hermetic" and the front sealing plate of the groove in the bearing cap.	
6	Cut each gasket at the level of the bearing caps, using a sharp blade. Clean carefully the joint faces of the crankcase and sump. Smear the joint face on the crankcase, with *very liquid* "Hermetic". If necessary, dilute the "Hermetic" with methylated spirit. The longest screws are fitted on the front and rear bearings	Tee spanner 12 mm socket

		TOOLS
7	Fit the drain plug on the sump inserting a copper-asbestos washer. Place the sump in position, tighten the fixing nuts and screws, using the longest screws for the front and rear bearings. (No washers under the screw heads)	21 mm box spanner 12 mm socket with extension
8	Lower the engine assembly on to the car (see Op.ID 100-1, paragraphs 28 to 57). Fill up the engine with oil, 7 pints (4 litres) S.A.E. 20 oil.	
	REPLACEMENT OF SEALING SHELLS	
	To remove	
9	Remove the engine gearbox assembly (see Op. ID 100-1, paragraphs 1 to 26).	
10	Remove the fan in order to avoid damaging it when handling the parts	12 mm box spanner
11	Remove the air filter and pipe assembly. Disconnect the flexible petrol inlet pipe and the vacuum pipe from the carburettor. Remove the carburettor (spanner 1645-T, see Pl.16, fig.3)	12-17 mm box spanners Spanner 1645 -T
12	Remove the flexible pipe and water pipe assembly, left-hand side.	
13	Disconnect the leads from the sparking plugs. Remove the rubber and bakelite caps from the sparking plug tubes. Remove the sparking plugs (spanner 1603-T, see Pl.16, fig.4). Remove the cylinder head cover, take off sealing cups and rubber joints from sparking plug tubes	Spanner 1603-T 12 mm box spanner
14	Disconnect the gearbox from the engine (spanner 1677-T, see Pl.54, fig.4 and spanner 2431-T, see Pl.61, fig.1)	Spanner 1671-T Spanner 2431-T
	IMPORTANT NOTICE - Do not roll the gearbox on the brake discs, use stand 2497-T (see Pl.19)	Stand 2497-T
15	Remove the clutch and the flywheel	12-17 mm box spanners
16	Drain engine oil	21 mm box spanner
17	Turn the engine over and place it on a stand (stand MR.3053-170, see Pl.18, fig.1) Remove the timing cover and the sump	Stand MR.3053-170 12 mm box spanner

TOOLS

18 To remove the timing chain and pinion assembly:

a) Undo the nuts. Wedge the pinions by means of the setting gauge 1680-T (see Pl.15, fig.2) or fix the crankshaft by means of a wooden wedge inserted between a crankshaft throw and the crankcase; (spanner 1731-T, see Pl.15, fig.3) for the camshaft nut and spanner 1667-T (see Pl.15, fig.1) for the crankshaft nut ....

Setting gauge 1680-T
Spanner 1731-T
Spanner 1667-T

b) Turn the crankshaft until the throws are horizontal.

IMPORTANT - It is essential to place the crankshaft in this position before removing the timing chain and pinion assembly. Since the camshaft is not under control, if one of the valves is lifted and the crankshaft rotated, the corresponding piston cannot pass the T.D.C. without fouling the valve.

c) Remove the timing chain and pinion assembly without displacing them. Place chain and pinions on the bench held in position by the setting gauge 1680-T (see Pl.15, fig.2).
Remove the keys, and thrust washer (5), the adjusting shims (7) and the bearing thrust ring (6) (see Pl.1) ....

Setting gauge 1680-T

19 To remove the oil seals (see Pl.14):

a) Remove the assembly screws (8) from the oil seal sections (9 and 10) ....

8 mm box spanner

b) Remove the fixing screws from the bearings. Mark the direction of assembly of the centre bearing cap, remove the bearing caps together with their bearings and mark the latter ....

17 mm box spanner

c) Raise the crankshaft-connecting rod-piston assembly without removing the pistons from their liners.
Pack up the crankshaft from the cylinder block far enough to enable the fixing screws (40) of the upper section (9) of the oil seal to be removed.
Remove the oil seal sections (9 and 10) ....

12 mm spanner

20 Clean the parts. Carefully scrape the joints.

To Fit

21 From the shim steel 0.10 mm thick cut out a strip 200 mm long x 10 mm wide.

22 To fit the oil seals (see Pl.14):

a) Fit the upper shell (9) on the cylinder block and the lower shell (10) on the bearing cap. Insert the fixing screws (40) without tightening them.

b) Make sure that the upper bearings (in the crankcase) are clean. Oil the parts with an oilcan.
Place the shim steel strip (prepared in paragraph 21) round the crankshaft oil-thrower (see Pl.14, fig.1) and mount the crankshaft in its bearings.
With the lower bearing in position in the front bearing cap, fit the bearing cap.
Guide the cheek (11) (see Pl.1) during this operation.
Tighten the assembly screws (8) of the cap sections. Tighten the bearing cap fixing screws to 72 ft.lbs (10 m.kg) (torsion spanner 2471-T, see Pl.7, fig.2) ....

8 mm box spanner
Torsion spanner 2471-T
17 mm socket

TOOLS

NOTE - Do not rotate the crankshaft while centring the caps.

c) Tighten the fixing screws (40) of the half segments alternately to 9.5 ft.lbs (1.3 m.kg) .... 12 mm spanner

d) Remove the assembly screws (8) of the half segments. Remove the bearing cap, raise the crankshaft and remove the shim steel strip .... 8 mm box spanner

e) Smear the mating surfaces of the half segments with "Festinol".
Offer up the bearing caps fitted with their bearings (according to reference marks made when dismantling).
Place the sump gaskets in position. Insert the cork ends of the gaskets under the front and rear bearing caps level with the face of the joint with the half shells and timing cover; smear these areas with "Hermetic".
Tighten the bearing screws to 72 ft.lbs (10 m.kg) (torsion spanner 2471-T, see Pl.7, fig.2).
Insert and tighten the half shell assembly screws. Do not rotate the crankshaft (see note paragraph 18) .... Torsion spanner 2471-T; 17 mm socket

NOTE - Festinol is sold by Ripolin.

23 To adjust the end float of the crankshaft (see Pl.1):

Put the bearing cheek (6) in position with the groove engaged on the retaining pin.
Fit an adjusting shim (7) 0.05 mm thick, the thrust washer (5), a distance piece or an old crankshaft pinion (in order to avoid displacement of the timing gear).
Tighten the nut (39) (spanner 1667-T, see Pl.15, fig.1). Push the crankshaft towards the bearing on timing gear side using a lever or a wedge located between a crankshaft throw and the crankcase.
Measure the clearance between the bearing cheek (6) and the thrust washer (5) (at "j"). This clearance must be between 0 and 0.09 mm. Select from among the shims sold by our Spare Parts Department one which will give this clearance.
Remove the distance piece or the old pinion .... 8 mm box spanner; Spanner 1667-T

24 To fit the timing gear:

a) Fit the chain and pinion assembly making sure that the keys are properly in position on the camshaft and crankshaft.

b) Tighten the camshaft nut to 108 ft.lbs (15 m.kg) (spanner 1731-T, see Pl.15, fig.3) and that of the crankshaft to 145 ft.lbs (20 m.kg) (spanner 1667-T, see Pl.15, fig.1), keep the pinion in position with the aid of the setting gauge 1680-T (see Pl.15, fig.2) or keep the crankshaft fixed by means of a wooden wedge inserted between a crankshaft throw and the crankcase.

c) Turn down the nut locking tabs .... Spanner 1731-T; Spanner 1667-T; Setting gauge 1680-T

25 To fit the sump:

a) In the bearing cap grooves place:
at the front - cork gasket the edges of which must be smeared with "Hermetic"
at the rear - cork gasket, the edges of which must be smeared with "Hermetic" and the front groove sealing plate. Smear the joints with "Hermetic" especially in the corners.

		TOOLS
	b) Cut the gaskets of the sump at the level of the bearing caps, using a sharp blade. c) Smear the joint face of the crankcase with *very liquid* "hermetic". If necessary, dilute the "hermetic" with methylated spirit. Do not fit a paper gasket. d) Fit the sump and tighten the fixing screws. The longest screws are fitted on the front and rear bearings	Tee spanner 12 mm socket
26	Fit the timing cover, inserting a paper joint. Tighten the fixing screws to 11 ft.lbs (1.5 m.kg) (brass washers under the heads of the 3 screws projecting inside the timing cover)	12 mm box spanner
27	Fit the flywheel. Tighten the fixing screws to 36 ft.lbs (5 m.kg) (no locking tabs) (torsion spanner 2471-T, see Pl. 7, fig. 2)	Torsion spanner 2471-T 17 mm socket
28	To couple the clutch to the flywheel : a) Make sure that the clutch disc bearing faces on the flywheel and on the clutch are clean. b) Couple the clutch to the flywheel using a mandrel 1712-T (see Pl. 40, fig. 4) or a primary shaft to centre the clutch plate. When tightening, make sure that the mandrel slides freely, thus indicating that the plate has been properly centred. Tighten the fixing screws to 14 ft.lbs (2 m.kg) (spring washers under screw heads). Remove the mandrel	Mandrel 1712-T 12 mm box spanner
29	Turn the engine over and place it on stand 2497-T (see Pl. 19). Insert sealing cups and the rubber joints on the sparking plugs tubes. Fit cylinder head cover, sticking the gasket to the cover with "Hermetic". Tighten the fixing nuts (leather and plain washers). Fit the sparking plugs (spanner 1603-T, see Pl. 16, fig. 4). Fit the bakelite and rubber caps on the sparking plug tubes. Connect the leads to the sparking plugs	12 mm box spanner Spanner 1603-T
30	Smear the paper gasket with *liquid hermetic* and place it on the face of the crankcase which receives the clutch housing, in the region around the oil thrower. Connect the gearbox to the engine (spanner 1677-T, see Pl. 54, fig. 4 and spanner 2431-T, see Pl. 61, fig. 1).	Spanner 1677-T Spanner 2431-T
31	Fit the carburettor, inserting a fibre gasket. Tighten the fixing nuts (spring washers) (spanner 1645-T, see Pl. 16, fig. 3). Connect the flexible petrol inlet pipe and the vacuum pipe to the carburettor	Spanner 1645-T 8 mm box spanner
32	Fit the air filter and pipe assembly. Fit the fan *and tighten the screws to 7·5 ft. lbs. (1 m. kg.)*. Do not exceed this tightening	12-17 mm box spanners
33	Fit the engine-gearbox assembly on the car (see Op. ID 100-1, paragraphs 28 to 57).	
	NOTE - The assembly of the hoses and water pipe will be fitted after the radiator is in position.	

PARTICULAR POINTS

Valve clearance = 0·008" (0·20 mm) for the inlet valves and 0·010" (0·25 mm) for the exhaust valves.

Adjust the valves of one cylinder with the piston at T.D.C., end of compression, the valve of the corresponding cylinder is then at the point of balance. (1st cylinder, the valves of the 4th cylinder being at the point of balance, 3rd cylinder, the valves of the 2nd cylinder being at the point of balance, 4th cylinder, the valves of the 1st cylinder being at the point of balance, 2nd cylinder, the valves of the 3rd cylinder being at the point of balance.)

		TOOLS
	ADJUSTING.	
1	Remove the air filter and pipe assembly	12-17 mm box spanners
2	To remove the cylinder head cover (see Pl. 1) :	
	a) Disconnect the leads from the sparking plugs. Remove the rubber (41) and bakelite (42) caps from the sparking plug tubes.	
	b) Remove the sparking plugs (spanner 1603-T, see Pl. 16, fig. 4) so as to avoid breaking the electrodes when moving the cylinder head cover	Spanner 1603-T
	c) Remove the cylinder head cover; do not mislay the sealing joints (2) for the sparking plug tubes	12 mm box spanner
3	Adjust the clearance of the valve rockers to : 0.008" (0.20 mm) for the inlet valves; 0.010" (0.25 mm) for the exhaust valves. Adjust the valves of one cylinder with the piston at T.D.C. (end of compression stroke). The valve of the corresponding cylinder is then at point of balance, that is, the inlet valve is at start of admission and the exhaust valve at the end of exhaust (turn the engine over by means of the starting handle). Adjust the valves of : 1st cylinder, the valves of the 4th cylinder being at point of balance. 3rd cylinder, the valves of the 2nd cylinder being at point of balance. 4th cylinder, the valves of the 1st cylinder being at point of balance. 2nd cylinder, the valves of the 3rd cylinder being at point of balance.	
4	Fit the cylinder head cover (see Pl. 1) using "Hermetic" compound to stick the gasket on the cover only. Make sure that the sealing joints (2) are properly located in the sparking plug tube cups (1). Tighten the cylinder head fixing nuts (leather and plain washers)	12 mm box spanner
5	Fit the air filter and pipe assembly. Tighten the fixing nuts (spring washers). Tighten the hose clip on the pipe to the carburettor	12-17 mm box spanners

PARTICULAR POINTS

Removal

Disengage the push rods by lifting the inlet rockershaft slightly. Remove the cylinder head fitted with the inlet rockershaft.

Fit the cylinder head gasket, with the crimping towards the cylinder barrels. Old type gaskets must be smeared with boiled linseed oil. New gaskets (varnished) are fitted dry.

Assembly

18 *Fit the cylinder head, fitted with the inlet rockershaft (make sure that the two locating dowels are on the cylinder block.*

Fit the push rods (slightly raise the rockershaft). Fit the exhaust rockershafts.
Tighten the cylinder head fixing screws: 1st tightening 21·75 ft. lbs. (3 m.kg), 2nd tightening 43·5 ft. lbs. (6 m.kg) (do not exceed the tightening torsion and observe the order of tightening indicated on Pl.7).
Adjust the valve clearances to: inlet 0·008″ (0·20 mm), exhaust 0·010″ (0·25 mm) (see Op.ID 122–0).

	REMOVAL (see Pl. 1 and 3).	TOOLS
1	Drain the cooling system. Retain the water, which contains anti-freeze.	
2	Remove the air filter and pipe assembly	12-17 mm box spanners
3	Disconnect the leads from the sparking plugs.	
4	Disconnect the choke control and the accelerator control from the carburettor. Disconnect the fuel inlet pipe and the vacuum pipe from the carburettor. Remove the carburettor (spanner 1645-T, see Pl. 16, fig. 3)	8 mm box spanner Spanner 1645-T
5	Disconnect the intake and delivery hoses from the water pump.	
6	Remove the radiator tie-bar	8-12 mm box spanners
7	Remove the fan	12 mm box spanner
8	Remove the dynamo tie-rod and release the belt	12-14 mm spanners and box spanners
9	Disconnect the retaining bracket for the front brake connection pipe from the water pump	12 mm box spanner
10	Disconnect the lubrication tube from the cylinder head	12 mm box spanner
11	Disconnect the feed hose for the heating and demister radiator from the pipe on the cylinder head.	

		TOOLS
12	Remove the rubber (41) and bakelite (42) caps from the sparking plug tubes. Remove the 4th sparking plug (spanner 1603-T, see Pl. 16, fig. 4)	Spanner 1603-T
13	Remove the cylinder head	12 mm box spanner
14	Remove the sealing cups (1) and the rubber joints (2) from the sparking plug tubes.	
15	Remove the half clips for securing the down exhaust pipe to the manifold	12 mm box spanner
16	Undo the cylinder head fixing screws (3 and 43). Remove the nuts and top clamps (52) from the fixing studs of the exhaust rockershaft. Remove the exhaust rockershaft complete with washers, rockers and springs. Lift the inlet rockershaft and release the push-rods	Ratchet spanner 12-14 mm sockets
17	Remove cylinder head. Remove cylinder head gasket.	
	REFITTING (see Pl. 1 and 3).	
18	Fitting the cylinder head :	
	a) Place the cylinder head gasket in position, with the crimping towards the cylinder barrels. The old type joints should be fitted by first smearing with boiled linseed oil. New gaskets (varnished) should be fitted dry. Make sure that the two locating dowels are on the cylinder block.	
	b) Place the cylinder head in position. Be careful of the lubrication pipes and the petrol outlet pipe. Slightly raise the rockershafts and fit the push-rods (the longest rods are for the exhaust). Fit the top clamps (52) and tighten the nuts on the exhaust rockershaft fixing studs.	
	c) Insert the cylinder head fixing screws (3 and 43) and tighten (torsion spanner 2471-T, see Pl. 7, fig. 2) : 1st tightening : 21.75 ft.lbs (3 m.kg). 2nd tightening : 43.5 ft.lbs (6 m.kg). *The tightening torques are extremely important.* - In no circumstances must they exceed 43.5 ft.lbs (6 m.kg). Observe the order of tightening (see Pl. 7, fig. 1). During the tightening process, make sure that the rocker push-rods are properly engaged in the sockets of the adjusting screws	12 mm box spanner Torsion spanner 2471-T 14 mm socket
	NOTE:*The cylinder head nuts must be retightened after the car has covered 500 and 2,000 km.* Procedure must be as follows :- 1. Deal with one cylinder head nut at a time. 2. Slacken fully each nut. Retighten to a torsion of 44 ft.lbs (6 m.kg) (torque loading spanner 2471-T, see Pl.7). 3. After a few thousand kilometres, retighten in the same manner.	

		TOOLS
19	Connect the lubrication tube to the cylinder head. Insert a double joint	12 mm box spanner
20	Connect the feed hose for the heater unit radiator to the steel pipe on the cylinder head. Tighten the clip, insert an elastic ring.	
21	Couple the retaining bracket of the front brake connection pipe to the water pump	12 mm box spanner
22	Put the dynamo and water pump belt in position. Fit the dynamo tie-rod. Tension the belt and tighten the fixing nuts of the tie-rod (plain and spring washers). Tighten the dynamo fixing screws	12 mm spanner and box spanner 14 mm spanner
23	Fit the fan. Tighten the screws to a torsion of 7.5 ft.lbs (1 m.kg). (Do not exceed this tightening torsion)	12 mm box spanner
24	Fit the radiator tie-bar (plain and spring washers). Secure the flexible air pipe on the radiator tie-bar. Fit a Ligarex collar (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
25	Connect the intake and delivery hoses to the water pump. Tighten the clips, insert an elastic ring under the clip on the flexible delivery pipe.	
26	Fit the carburettor (see Op. ID 142-1).	
27	Adjust the rockershafts (see Op. ID 112-0).	
28	Fit the sealing cups (1) and the rubber joints (2) on the sparking plug tubes. Fit the cylinder head cover. If the gasket needs renewing, use "Hermetic" to stick it to the cylinder head cover only. Tighten the fixing screws (leather and plain washers)	12 mm box spanner
29	Fit the 4th sparking plug (spanner 1603-T, see Pl. 16, fig. 4). Fit the bakelite (42) and rubber (41) caps on the sparking plug tubes. Connect the leads to the sparking plugs	Spanner 1603-T
30	Fit the air filter and tube assembly	12-17 mm box spanners
31	Fill the radiator with water, with the engine running. Check the unions for tightness.	

PARTICULAR POINTS

Dismantling.

1 *One cannot replace the sparking plug tubes or the valve seatings without the use of special tools. Do not remove the studs.*

2 *One can replace the valve guides (see paragraph 2).*

If a thread is damaged (except spark plug holes) it is possible to replace it by a "Heli-Coil" thread (see note MR 4279).

Assembly

7 *Characteristics of the valve springs:*
Outer springs: L = 37 mm under load of 24·200 ± 1·350 kg and L = 28·5 mm under load of 52 ± 2·800 kg.
Inner springs: L = 24·5 mm under load of 5·250 + 0·300 kg and L = 16 mm under load of 11 + 0·600 kg.

8 *Fitting the valves (do not fit a sealing ring on the exhaust valves).*

		TOOLS
	DISMANTLING (see Pl. 3).	
1	Stripping the cylinder head :	
	a) Remove the short screws (43) fixing the cylinder head, the inlet rocker shaft and the rocker shaft supports.	
	b) Stripping the inlet rocker shaft assembly : Remove fixing screws (3), the clamps (33), the washers (37), the springs (45) and the rocker arms (34 and 35). Drive out the plugs from the rocker shaft by means of a pin punch passing through the fixing screw holes. Clean the interior of the shaft thoroughly using a metal pin and make sure that the lubrication holes of the inlet and exhaust shafts as well as those of the rocker arms and the shaft supports are clear. Refit the plugs and solder them with tin solder.	
	c) Remove water pump and water pump cover	12-14-17 mm box spanners
	d) Remove the exhaust manifold and the fixing bracket of the manifold screen. Remove the inlet manifold	12 mm box spanner
	e) Remove the valves (spring compressor 1614-T and support and base assembly 1616-T, see Pl. 5)	Spring compressor 1614-T Support and base assembly 1616-T
	f) Remove the inlet pipe cover plates, the rear plate assembly and the water outlet pipe	12 mm box spanner
	NOTE - Since the cylinder head is made of aluminium, the sparking plug tubes and the valve seatings cannot be replaced without special tools. Do not remove the studs.	

TOOLS

2 Replacing the valve guides (tool 1644-T, see Pl.9):

a) To withdraw the faulty guide or guides (see Pl.8, fig.1):
Place the screw (D) in the guide to be withdrawn by inserting it through the combustion chamber.
Place the pipe (C) and washer (B) in position and screw the nut (A) on the screw (D). Grease the thread of screw (D) and the bearing faces of washer (B) with tallow.
Hold screw (D) and rotate nut (A) until the guide is driven out.

b) To refit a new guide:
On the screw (D) place a bushing (E) (for inlet valve guide see Pl.8, fig.2) or a bushing (G) (for exhaust valve guide see Pl.8, fig.3).
Insert the screw (D) complete with bushing (E) or (G) in the guide bore.
Insert the screw, bushing and guide assembly through the combustion chamber and place the bushing (F), washer (B) and nut (A) in position. Grease the thread of screw (D) and the bearing faces of the washer (B) with tallow.
Hold the screw (D) and rotate nut (A), after making sure that the guide is in the proper position (see Pl.8, figs. 2 and 3). The lowest part of the end of the guide must be directed towards the centre of the combustion chamber. If necessary make a reference mark at this point with a little paint before fitting the guide.
Tighten the nut (A) until the bearing face of the bushing (E or G) rests on the face of the valve seat (the latter must be clean) ....

Tool 1644-T
8 mm box spanner
17 mm spanner

c) Ream the new guides to a diameter of $9^{+0.015}_{-0.010}$ mm (reamer 1642-T, see Pl.9, fig.2).
Check the bore with a "Go-Not-Go" plug gauge, or failing this, with a valve stem.
Too much clearance leads to excessive consumption of oil..........

Reamer 1642-T
Plug gauge

3 Grind the valves (valve grinder, Black & Decker type).

NOTE - The face angle of the inlet valves is 120°.
The face angle of the exhaust valves is 90°.

Round off the corners of the valve heads at "a" and "b", see Pl.4, fig.2): the radius of the corners should be about 0.5 mm (see Pl.4, fig.3).

4 Grind the valve seatings (see Pl.4):

NOTE - The width "l" of the seat must be between 0.9 and 1.5 mm. To obtain this dimension use the following grinding wheels:

Inlet valve seat:

For the valve seat face	120° biconical wheel	1662-T
For top clearance	150° biconical wheel	1630-T
For bottom clearance	90° biconical wheel	1630-T

TOOLS

Exhaust valve seat:

For the valve seat face	90° biconical wheel	1627-T
For top clearance	150° biconical wheel	1627-T
For bottom clearance	60° biconical wheel	1633-T

It is essential that the large diameter of the seat face should be equal to the greatest diameter of the valve (see figs. 1 and 2) .... Wheels 1662-T
1630-T
1627-T
1633-T

5 Grind in the valves (suction valve grinder 1615-T, see Pl.4, fig.4)
This attachment can be driven by an electrically, pneumatically or manually grinder .... Valve grinder 1615-T

6 *Clean the cylinder head with great care,* in order to remove all traces of carborundum from the valve chambers or gas passages.

ASSEMBLY

7 To calibrate the valve springs (spring calibrator 2420-T, see Pl.6).

a) Outer springs:
Length = 37 mm, under load of 53 lbs ± 3 lbs (24.2 ± 1.350 kg.)
Length = 28.5 mm, under load of 115 lbs ± 6 lbs (52 ± 2.800 kg.)

b) Inner springs
Length = 24.5 mm, under load of 11.5 lbs ± .75 lbs (5.250 ± 0.300 kg.)
Length = 16 mm, under load of 24 lbs ± 1.25 lbs (11 ± 0.600 kg.) .... Spring calibrator 2420-T

8 To assemble cylinder head:

a) Fit the valves (spring compressor 1614-T and support and base assembly 1616-T, see Pl.5):
Oil the faces and stems of the valves. Place the valves in position. Fit a sealing ring (30) on the inlet valve stems only (see Pl.3, fig.2).

For each valve fit one thrust washer (31) for the outer spring and one shouldered thrust washer (32) for the inner spring.

Fit the exhaust valve springs. Fit the spring thrust cups, the retaining ring housing cup and the retaining rings (see fig.4) .... Spring compressor 1614-T
Support and base assembly 1616-T

NOTE - It is important that no sealing rings should be fitted on the exhaust valves.

TOOLS

b) To assemble the inlet rocker shaft assembly (see Pl. 3):

First oil the inlet rocker shaft (44) and then with the lubrication holes directed towards the bottom (on valve side) place on it, beginning at the front:

1 long screw (3) complete with shaft fixing cap (33).
1 washer (37),
1 spring (45),
1 left hand rocker (34),
1 washer,
1 long screw complete with cap,
1 washer,
1 right hand rocker (35),
1 spring,
1 washer ,
1 long screw complete with cap,
1 long screw complete with cap,
1 washer,
1 spring,
1 left hand rocker,
1 washer,
1 long screw complete with cap,
1 washer,
1 right hand rocker,
1 spring,
1 washer,
1 long screw complete with cap.

c) Fit the brackets and the inlet rocker shaft assemblies on the cylinder head.

d) Fit the water pump cover inserting a gasket smeared with "Hermetic". Fit the water pump and insert gasket smeared with "Hermetic". Tighten the fixing nuts and bolts.
Fit the inlet pipe cover plates, the inlet manifold, the rear plate and water outlet assembly, inserting gaskets smeared with "Hermetic". Tighten the fixing screws (plain washers under screw heads) .... 12-14-17 mm box spanners

e) Fit the exhaust manifold inserting copper asbestos gaskets ; fit the fixing brackets of the exhaust manifold screen (the upper bracket which is the longest goes at the front). Tighten the fixing nuts (spring washers) .... 12 mm spanner

PARTICULAR POINTS

Replacement of an inlet rockershaft assembly.

Removal

1 *Drain the radiator and the crankcase.*

7 *Remove the bracket of the last exhaust rockershaft assembly, to permit release of the last fixing screw of the inlet rockershaft and cylinder head. Remove the 4th exhaust rockershaft assembly, the first five screws fixing the inlet rockershaft and their caps, the washer and spring of the first inlet rocker, in order to disengage the inlet rockershaft with its rear bracket).*

Assembly

8 *Place the shaft in position with the rear bracket (with the lubrication holes directed towards the bottom and towards the valves).*

10 *Tighten the screws fixing the cylinder head: 1st tightening – 21·75 ft. lbs (3 m.kg), 2nd tightening – 43·5 ft.lbs (6 m.kg) (do not exceed the tightening torsion and observe the order of tightening indicated on Pl.7).*

Adjust the valve rocker clearances: Inlet – 0·008" (0·20 mm), Exhaust – 0·010" (0·25 mm) (see Op.ID 112–0).

Replacement of an exhaust valve rocker assembly.

21 *Place the shaft in position with the lubrication holes directed towards the bottom.*

Replacement of an inlet valve sealing ring.

Removal

27 *Raise the rocker assembly and remove the rocker pushrod of the valve in question.*

28 *With the piston of the valve in question at T.D.C., release the rocker at the side, place the collar MR.4244 in position and compress the valve springs (see Pl.5).*

Assembly

32-33 *Unscrew the cylinder head fixing screws (right side). Tighten the screws (both sides) : 1st tightening – 21·75 ft.lbs (3 m.kg), 2nd tightening – 43·5 ft.lbs (6 m.kg) (do not exceed the tightening torsion and observe the order of tightening indicated on Pl.7)*

Replacement of a valve spring.

This operation is only an emergency repair. If the engine has been running for some time with a broken spring, the valve will have to be refaced.

Cleaning a cylinder head filter.

This operation should be carried out after every 3,700 miles (6,000 kms). Wash the filter element in petrol, immerse in engine oil and refit.

REPLACEMENT OF AN INLET ROCKER SHAFT ASSEMBLY

		TOOLS
	Removal (see Pl.1 and 3)	
1	Drain the radiator and crankcase but retain the water which contains antifreeze.	
2	Remove the air filter and tube assembly	12-17 mm box spanners
3	Disconnect the leads from the sparking plugs. Remove the rubber (41) and bakelite (42) caps from the sparking plug tubes. Remove the 4th sparking plug (spanner 1603-T, see Pl.16, fig.4) as a precautionary measure	Spanner 1603-T
4	Remove the cylinder head cover, the sealing gasket (2) and the cup (1) of the 4th sparking plug tube. Undo the fixing screws (3) of the inlet valve rocker shaft assembly and the fixing screws (43) of the cylinder head, right side. Remove the 4th exhaust rocker shaft, the first five screws fixing the inlet rocker shaft and their caps (33), the washer and the spring of the first inlet rocker	12-14 box spanners
5	Withdraw the inlet rocker shaft assembly and the rear bracket of the inlet and exhaust rocker shaft assemblies.	
6	To strip the rocker shaft: Remove the fixing screw (3) and cap (33), the washers (37), the springs (45) and rockers (34 and 35). Drive out the shaft plugs (44) with a pin punch passing through the holes for the fixing screws. Carefully clean the interior of the shaft with a metal pin and make sure that the lubrication holes of the shaft are clear.	
	Assembly (see Pl.1 and 3)	
7	To assemble the rocker shaft. Fit the shaft plugs (44) and solder with tin solder. Place in position on the shaft (previously oiled, and with the lubrication holes directed towards the bottom and towards the valves), the following, starting from the front: 1 left hand rocker (34), 2 washers (37), 1 right hand rocker (35), 1 spring (45), 2 washers (37), 1 spring (45), 1 left hand rocker (34), 2 washers 1 right hand rocker (35), 1 spring (45), 1 washer (37), 1 long screw (3) with cap (33).	

		TOOLS
8	Make sure that the cylinder head is properly located on the locating dowels and that the intermediate supports (46) are in position on the cylinder head. Place the rocker shaft and bracket assembly in position. Fit the shaft in position on the other brackets. Fit spring (45) and washer (37) of the first rocker. Fit the first five fixing screws (3) together with the caps (33). Screw up the shaft fixing screws and the cylinder head fixing screws, right hand side. During this operation made sure that the washers (37) are properly fitted. Tighten the cylinder head fixing screws (torsion spanner 2471-T, see Pl.7, fig.2): 1st tightening: 21.75 ft.lbs (3 m.kg). 2nd tightening: 43.5 ft.lbs (6 m.kg). *These torques are of the greatest importance.* Observe the correct tightening order (see Pl.7, fig.1). When tightening make sure that the rocker arm rods are seated in the sockets in the adjusting screws *NOTE: It is necessary to retighten the cylinder head screws after the car has run 300 miles (500 km) to 1200 miles (2000 km). (See Op. ID 112-1, para 18 of Note).*	Torsion spanner 2471-T 14 mm socket
9	Fit the fourth rocker shaft. Tighten the fixing screws inserting the caps	12 mm box spanner
10	Adjust the valve rocker clearances to 0.008" (0.20 mm) for the inlet valve rockers and to 0.10" (0.25 mm) for the exhaust valve rockers (see Op. ID 112-0)	
11	Place the cups (1) and the gaskets (2) in position on the sparking plug tubes. Fit the cylinder head cover, securing the gasket to the latter only with sealing compound. Tighten the fixing nuts (leather and plain washers)	12 mm box spanner
12	Fit the fourth sparking plug (spanner 1603-T, see Pl.16, fig.4). Fit the bakelite (42) and rubber (41) caps on the sparking plug tubes. Connect the leads to the sparking plugs	Spanner 1603-T
13	Fit the air filter and pipe assembly. Tighten the fixing nuts (spring washers). Tighten the collar securing the pipe assembly to the carburettor	12-17 box spanners
14	Fill the radiator, with the engine running.	

REPLACEMENT OF AN EXHAUST ROCKER ASSEMBLY

Removal (see Pl.1 and 3).

15	Remove the air filter and tube assembly	12-17 mm box spanner
16	Disconnect the leads from the sparking plugs. Remove the rubber (41) and bakelite (42) caps from the sparking plug tubes. Remove the fourth sparking plug as a precautionary measure (spanner 1603-T, see Pl.16, fig.4)	Spanner 1603-T
17	Remove the cylinder head cover, the sealing gaskets (2) and the cups (1) from the sparking plug tubes	12 mm box spanner

		TOOLS
18	Remove the rocker assembly fixing nuts. Remove the assembly and the caps (52)	12 mm box spanner
19	To strip the rocker assembly: Remove washer (37), the spring (29) and the rocker (36 or 38) Remove the expandable washers from the shaft with a punch. These washers must be renewed after each dismantling operation. Carefully clean the interior of the shaft with a metal pin and make sure that the lubrication holes are not blocked.	
	NOTE - To replace a bracket it is necessary to remove the inlet rocker shaft (see this operation, paragraph 5).	
	Assembly (see Pl.1 and 3)	
20	To assemble the rocker assembly: a) Before fitting the shaft expansion washers, smear the washer seating faces with "Hermetic". b) To fit the rocker in position: 1st and 3rd cylinders: place on the shaft, starting from the front, a spring (29), the rocker (38) and a washer (37). 2nd and 4th cylinders: place on the shaft, starting from the front, a washer (37), the rocker (36), and a spring (29).	
21	Place the shaft in position on its bracket with the lubrication holes towards the bottom. Fit the caps (52) on the fixing studs. Tighten the nuts; when tightening make sure that the spherical end of the adjusting screw engages properly in the socket on the push rod	12 mm box spanner
22	Adjust the clearance of the valve rockers to 0.008" (0.20 mm) for the inlet valves and 0.010" (0.25 mm) for the exhaust valves (see Op.ID 112-0).	
23	Fit the cups (1) and the sealing gaskets (2) on the sparking plug tubes. Fit the cylinder head cover, the gasket being secured with "Hermetic" to the cylinder head only. Tighten the fixing nuts (leather and plain washers)	12 mm box spanner
24	Fit the fourth sparking plug (spanner 1603-T, see Pl.16, fig.4). Fit the bakelite (42) and rubber (41) caps on the sparking plug tubes. Connect the sparking plug leads	Spanner 1603-T
25	Fit the air filter and tube assembly. Tighten the fixing nuts (spring washers). Tighten the clip securing pipe to carburettor	12-17 mm box spanner

		TOOLS
	REPLACEMENT OF AN INLET VALVE SEALING RING	
	Removal (see Pl. 1).	
26	Remove the cylinder head cover (see paragraph 15 to 17, this operation).	
27	Unscrew the inlet rocker assembly fixing screws. Lift the rocker assembly and remove the rocker push-rod of the valve in question. Put the rocker assembly back in position and retighten the fixing screws. When tightening, make sure that the spherical ends of the adjusting screws engage in the sockets on the push-rods	14 mm box spanner
28	Release the rocker at the side, place the collar MR-4244 in position (see Pl. 17, fig. 4). With the piston of the valve in question at T.D.C. compress the valve springs (spring compressor 1614-T, see Pl.5).	Collar MR-4244 Spring compressor 1614-T
29	Remove the split cotters, the upper spring housing cup, the springs and the sealing rings (30) (see Pl.3, figs. 2 and 3).	
	Assembly (see Pl. 3).	
30	Make sure that the spring thrust washers (31) and (32) are in position. Place the sealing ring (30), the springs and the upper spring housing cups in position.	
31	Place the split cotters in position (collar MR-4244-T, spring compressor 1614-T, see Pl. 17, fig. 4)............	Collar MR-4244 Spring compressor 1614-T
32	Remove the cylinder head fixing screws (43) right-hand side, and the inlet rocker assembly and cylinder head fixing screws (3). Raise the inlet rocker assembly and replace the rocker push-rod which was removed in accordance with paragraph 29.	
33	Insert the cylinder head fixing screws and tighten (torsion spanner 2471-T, see Pl. 7, fig. 2). 1st tightening to 21.75 ft.lbs (3 m.kg) - 2nd tightening to 43.5 ft.lbs (6 m.kg). Never in any circumstances exceed a torque of 43.5 ft.lbs (6 m.kg). Adhere to the correct order of tightening (see Pl. 7, fig. 1). During the tightening operation, make sure that the sockets on the rocker arm push-rods are properly engaged on the spherical ends of the rocker arm adjusting screws. .... *NOTE: It is necessary to retighten the cylinder head screws after the car has run 300 miles (500 km) to 1200 miles (2000 km). See Op. ID 112-1, para 18 of Note).*	Torsion spanner 2471-T 14 mm socket
34	Check the valve rocker clearance (0.008" (0.20 mm) for the inlet valve and 0.010" (0.25 mm) for the exhaust valve). Make any necessary adjustments (see Op. ID 112-0).	

		TOOLS
35	Fit the cups (1) and the rubber gaskets (2) on the sparking plug tubes (see Pl. 1).	
	Fit the cylinder head cover, securing the gasket with "Hermetic" to the cylinder head cover only. Tighten the nuts (leather and plain washers).	
	Fit the 4th sparking plug (spanner 1603-T, see Pl. 16, fig. 4), the bakelite (42) and rubber (41) caps (see Pl. 1) of the sparking plug tubes.	
	Connect the sparking plug leads	12 mm box spanner Spanner 1603-T
36	Fit the air filter and tube assembly. Tighten the fixing nuts (spring washers). Tighten the clip securing the piping on the carburettor	12-17 mm box spanners
	REPLACEMENT OF A VALVE SPRING	
	NOTE - This operation is only an emergency repair. If the engine has been running for some time with a broken valve spring, the valve will have to refaced (see Op. ID 112-3).	
	Replacement of an inlet valve spring.	
37	(See paragraphs 26 to 36, this operation).	
	Replacement of an exhaust valve spring.	
	To remove (see Pl. 1 and 3).	
38	Remove the cylinder head cover (see paragraphs 15 to 17, this operation)	12-17 mm box spanners Spanner 1603-T
39	Remove the rubber gaskets (2) and the cups (1) from the sparking plug tubes.	
	Remove the rocker assembly. Strip the shaft: remove the washer (37), the rocker (36) or (38), and the spring (29).	12 mm box spanner
40	Fit the shaft (28) as a temporary measure. Place the locking caps (52) in position and tighten the nuts	12 mm box spanner
41	Move the piston of the valve in question to T. D. C.	
	Place the collar MR-4244 in position on the spring housing cup (see Pl. 17, fig. 4) and compress the springs of the valve (spring compressor 1614-T, see Pl. 5).	
	Remove the split cotters, the split cotter retaining cup, the upper spring bearing cup and the springs	Collar MR-4244 Spring compressor 1614-T
	Assembly (see Pl. 1 and 3).	
42	Make sure that the thrust washers (31) and (32) for the springs are in position. Fit the new springs and the upper spring housing cup.	
	Compress the assembly (collar MR-4244 and spring compressor 1614-T, see Pl. 17, fig. 4) and fit the split cotter housing cup and the split cotters	Collar MR-4244 Spring compressor 1614-T

NOTE - No sealing ring should be fitted on the exhaust valve - when the motor is running the valve will rotate and destroy the ring.

43 Remove the shaft (28) from the cylinder head and assemble the rocker assembly: fit the washer (37), the rocker (36) or (38) and the spring (29). Fit the rocker assembly on the cylinder head, fix the locking caps (52) and tighten the rockershaft fixing nuts. Make sure that the socket on the rocker rod is engaged on the spherical end of the adjusting screw .... 12 mm box spanner

44 Adjust the valve rocker clearance to 0.010" (0.25 mm) (see Op. ID 112-0).

45 Fit the cylinder head cover (see paragraphs 23 to 26, this operation).

TO CLEAN A CYLINDER HEAD FILTER (see Pl. 1).

NOTE - The filter element should be cleaned after every 3,750 miles (6,000 kms) (when the car is used on normal roads).

46 Undo the knurled nut (49). Remove the cover (50) and withdraw the filter element (51).

47 Clean the parts. Wash the filter element (51) in petrol and then immerse in engine oil and allow it to drain. Brush the filter element and blow a stream of compressed air on it.

48 Replace the filter element (51) on the cylinder head. Refit the cover (50) and tighten the nut (49).

PARTICULAR POINTS

Replacement of a timing chain or timing gears.

4 *Align the reference marks (punch marks) a straight edge passing through the centre line of the two pinions must pass through the reference mark (setting gauge 1680–T).*

5 *Move the two end pistons to the top dead centre in order to fit the chain and pinion assembly.*

Tightening torsion of the nuts: crankshaft = 145 ft.lbs (20 m.kg), camshaft = 110 ft.lbs (15 m.kg) (lockwashers).

7 *Insert a brass washer under each of the three screws projecting inside the timing case.*

Replacement of a camshaft.

Fitting.

13 *Insert a ring seal in the front groove of the camshaft. Tighten the screws fixing the rear thrust flange to 7·2 ft.lbs (1 m.kg) (lockwashers).*

14 *Insert a brass washer under the head of each of the three scews projecting inside the timing case.*

20 *Tighten the cylinder head fixing screws : 1st tightening 21·75 ft.lbs (3 m.kg), 2nd tightening 43·5 ft.lbs (6m.kg) (do not exceed this tightening torsion and follow the tightening sequence indicated on Pl.7).*

21 *Adjust the valve rocker clearances : inlet = 0·008" (0·20 mm), exhaust = 0·010" (0·25 mm).*

Replacement of rocker tappets.

Removal.

It is advisable to remove one tappet at a time (extractor 1608–T).

Assembly.

Ensure that the locating dowels for the cylinder head are in position. Tighten the fixing screws : 1st tightening 21·75 ft.lbs (3 m.kg), 2nd tightening 43·5 ft.lbs (6 m.kg) (follow the tightening sequence indicated in Pl.7).

Adjust the valve rocker clearances : inlet = 0·008" (0·20 mm), exhaust = 0·10 (0·25 mm) (see Op.ID 112–0).

REPLACEMENT OF A TIMING CHAIN OR TIMING GEARS

		TOOLS
	To remove :	
1	Remove the engine and gearbox assembly (see Op. ID 100-1, paragraphs 1 to 26).	
2	Remove the timing case	12 mm box spanner
3	Keep the crankshaft and camshaft pinions in position with the setting gauge 1680-T (see Pl. 15, fig. 2). Turn back the locking tabs and unscrew the pinion fixing nuts (spanner 1731-T for camshaft nut, see Pl. 15, fig. 3 and spanner 1667-T for crankshaft nut, see Pl. 15, fig. 1). Withdraw the setting gauge 1680-T. Withdraw the timing gear and chain assembly from the engine	Setting gauge 1680-T Spanner 1731-T Spanner 1667-T
	To refit:	
4	Place the crankshaft and camshaft pinions on the bench. Align the reference marks on the two pinions. A straight edge passing through the centre lines of the two pinions must pass through the reference mark (punch mark on a tooth) of the camshaft pinion and through the reference mark (punch mark between two teeth) of the crankshaft pinion. Setting gauge 1680-T may also be used (see Pl. 15, fig. 2). This tool is marked with a centre line enabling the reference marks to be aligned. Then fit the chain on the two pinions	Setting gauge 1680-T
5	To fit the timing chain and gear assembly : a) Move the two end pistons to the T. D. C. b) Without displacing the pinions put the chain and gear assembly into position on the engine. Rotate the camshaft by means of its pinion so that keyways on the pinions and shafts correspond. c) Fit the chain and pinion assembly making sure that the keys are properly located on the camshaft and on the crankshaft. .	
6	Wedge the crankshaft by means of the setting gauge 1680-T (see Pl. 15, fig. 2). Tighten the camshaft nut to 110 ft. lbs (15 m. kg) (spanner 1731-T, see Pl. 15, fig. 3) (insert tabwasher). Tighten the crankshaft nut to 145 ft. lbs (20 m. kg) (spanner 1667-T, see Pl. 15, fig. 1) (insert a tabwasher). Withdraw the setting gauge 1680-T and turn down the tabs on the nuts	Setting gauge 1680-T Spanner 1731-T Spanner 1667-T
7	Fit the timing case, inserting a gasket. Tighten the fixing screws to 11 ft. lbs (1.5 m. kg) and insert a brass washer, under each of the three screws projecting inside the timing case	12 mm box spanner
8	Fit the engine and gearbox assembly on the vehicle (see Op. ID 100-1, paragraphs 28 to 57).	

REPLACEMENT OF A CAMSHAFT

		TOOLS
	Removal (see Pl. 1).	
9	Remove the engine and gearbox assembly (see Op. ID 100-1, paragraphs 1 to 25).	
10	Remove the sump, distributor and oil pump (see Op. ID 111-4).	
11	Place the engine-gearbox assembly on a stand (stand 2497-T, see Pl. 19)	Stand 2497-T
12	Remove the air filter and tube assembly.	
	Remove the cylinder head cover	12-17 mm box spanners
13	Remove the nut fixing the dynamo tensioning bar.	
	Undo the lower nut of the front tie-rod support of the left-hand brake unit and lower the brake unit.	
	Unscrew the dynamo fixing screws, move the dynamo towards the engine and remove the belt	12-21 mm box spanners 14 mm spanner
14	Unscrew the cylinder head fixing screws.	
	Remove the cups (1) and the rubber gaskets (2) from the sparking plug tubes.	
	Remove the fixing nuts and bolts from the brackets for the rocker assembly.	
	Remove the exhaust rocker assembly, remove the rockershaft, rocker arms, brackets and fixing screws of the inlet rocker assembly and remove the exhaust rocker assembly brackets.	
	Remove the rocker push-rods	12-14 mm box spanners
15	Remove the fixing screw from the union of the cylinder head lubrication pipe.	
	Disconnect the flexible fuel feed pipe from the carburettor.	
	Remove the retaining bracket from the connecting tube for the front brakes.	
	Remove the cylinder head and cylinder head gasket.	
	Remove the tappets (extractor 1608-T, see Pl. 17, fig. 1)	Extractor 1608-T
16	Remove the timing chain and gear assembly (see Op. ID 120-1, paragraphs 2 and 3). Remove the key from the camshaft.	
17	Turn down the locking tabs and remove the fixing screws from the camshaft thrust flange (12). Remove the flange	12 mm box spanner
18	Remove the petrol pump fixing nuts. Remove the pump	14 mm box spanner
19	Remove the connecting pipe between the high pressure pump and pressure control valve (spanner 2220-T, see [illegible]l, fig. 4). Seal the apertures of the pump and pipe (see Pl. 89). Remove the high pressure pump	Spanner 2220-T 12 mm box spanner
20	Withdraw the camshaft from the rear of the engine.	

Assembly (see Pl. 1).

		TOOLS
21	Oil the bearing faces of the camshaft and insert from rear of engine. Insert a sealing ring (47) in the groove of the splined portion of the camshaft.	
	Fit the rear thrust flange (12), tighten the fixing screws to 7.2 ft.lbs (1 m.kg) and turn down the locking tabs	12 mm box spanner
22	Fit the timing chain and gear and the timing case (see Op. ID 120-1, paragraphs 4 to 7).	
23	Fit the high pressure pump complete with paper joint between pump and distance piece, the distance piece and a paper joint between the distance piece and cylinder block. Tighten the fixing screws (spring washers under heads).	
	Fit the connecting pipe between the pump and the pressure control cylinder, make sure that it is not strained when fitted. Tighten the unions moderately (spanner 2220-T, see Pl. 61, fig. 4)	12 mm box spanner Spanner 2220-T
24	Fit the petrol pump, inserting a cork gasket. Tighten the fixing screws (spring washers)	14 mm box spanner
25	Fit the tappets, first oiling them (extractor 1608-T, see Pl. 17, fig. 1)	Extractor 1608-T
26	Fit the cylinder head gasket, after smearing with boiled linseed oil, with the crimped edges towards the cylinder block.	
	Fit the cylinder head. Replace the rocker push-rods, first oiling the sockets.	
	Fit the exhaust rocker assembly brackets, the bracket assemblies, rocker assembly, fixing screws and inlet rockers, and the exhaust rocker shaft assemblies.	
	IMPORTANT NOTE - The lubrication holes on the exhaust rockershafts must be directed downwards.	
	Fit the locking caps (52) on the exhaust rocker assembly fixing studs.	
	Check that all the pieces are correctly fitted (see Op. ID 100-3, paragraphs 33 g and i and see Pl. 3).	
27	Tighten the exhaust rocker assembly fixing nuts.	
	Screw in the fixing screws for the inlet rocker assembly and for the cylinder head. During this operation make sure that the rocker push-rods are engaged on the spherical heads of the adjusting screws.	
	Screw in the short screws fixing the cylinder head	12-14 mm box spanners
28	Tighten the cylinder head fixing screws in the order specified (see Pl. 7, fig. 1), first tightening to 21.75 ft.lbs (3 m.kg) and then to 43.5 ft.lbs (6 m.kg). This tightening torque is very important (torsion spanner 2471-T see Pl. 7, fig. 2). In no circumstances must a torque of 43.5 ft.lbs (6 m.kg) be exceeded	Torsion spanner 2471-T 14 mm socket

NOTE - *It is necessary to retighten the cylinder head screws after the car has run 300 miles (500 km) to 1200 miles (2000 km). See Op. ID 112-1, para 18 of Note).*

		TOOLS
29	Adjust the valve rocker clearances (see Op. ID 112-0).	
30	Fit the cups (1) and the rubber joints (2) on the sparking plug tubes.	
	Fit the cylinder head cover, using "Hermetic" to secure the gasket to the cover only. Tighten the fixing nuts (plain and leather washers).	
	Fit the air filter and tube assembly. Tighten the fixing nuts (spring washers)	12-17 mm box spanners
31	a) Fit the front brake connection pipe in its clip, inserting a rubber ring and turn down the clip over the tube.	
	b) Place the water pump and dynamo belt in position. Tension the belt, tighten the dynamo fixing screw and the tie-rod fixing nut on the dynamo.	14 mm spanner 12 mm box spanner
	c) Connect the flexible petrol pipe to the carburettor.	
32	Adjust the height of the front left-hand brake unit: turn the adjusting nuts of the front support tie-bar until the plates project slightly to the front of the disc (about 1 mm) (seePl. 99, fig. 1)	21 mm spanner and box spanner
33	Insert the fixing screw for the cylinder head lubrication pipe union using a double copper joint	12 mm box spanner
34	Fit a covered chain round the water pump cover (chain 1697-T, see Pl. 42) and raise the engine on a pulley block..	Chain 1697-T
35	Fit the oil pump and the sump (see Op. ID 111-4, paragraphs 6 to 8).	
36	Fit the distributor (see Op. ID 211-1, paragraphs 3 to 6).	
37	Fit the engine and gearbox assembly on the vehicle (see Op. 100-1, paragraphs 28 to 57).	
	Fill up engine with oil - 7 pints (4 litres SAE 20 oil).	

REPLACEMENT OF ROCKER TAPPETS

		TOOLS
	To remove (see Pl. 1 and 3).	
38	Drain the cooling system (radiator and cylinder block). Retain the water which contains anti-freeze.	
39	Remove the air filter and tube assembly	12-17 mm box spanners
40	Remove the cylinder head (see Op. ID 112-1, paragraphs 3 to 17).	
41	Remove the rocker tappets (extractor 1608-T, see Pl. 17, fig. 1). NOTE - It is advisable to replace only one tappet at a time. Otherwise, the replacement rocker tappet could drop down the empty bore with its base up. In this position, it would be almost impossible to withdraw it without stripping the engine	Extractor 1608-T
	To refit (see Pl. 1 and 3).	
42	Insert the rocker tappets into position, after oiling them (use extractor 1608-T, see Pl. 17, fig. 1).	
43	Fit the cylinder head (see Op. 112-1, paragraphs 18 to 29).	
44	Fit the air filter and tube assembly (spring washers under the fixing nuts)	12-17 mm box spanners
45	Fill the radiator while the engine is running. Check the sealing of the connections (oil and water).	

ADJUSTMENTS OF REAR ENGINE MOUNTINGS (on vehicle) (see Pl. 25).

IMPORTANT NOTE - This operation is no longer required on vehicles produced since July 1959.

		TOOLS
1	Raise car on a lift or jack up the front of the car (jacking bracket 2505-T, see Pl. 111)	Jacking bracket 2505-T
2	To adjust the left-hand mounting (see fig. 3): Hold the rubber block adjusting nut (5) with a spanner 1700-T (see Pl. 25, fig. 2). Slacken the locknut (12) using spanner 1699-T (see Pl. 25, fig. 1). Tighten or slacken the adjusting nut until the fibre and rubber washer (9) rotates freely without play (spanner 1700-T). Tighten the locknut (spanner 1699-T)	Spanner 1699-T Spanner 1700-T
3	To adjust the right-hand mounting (see fig. 1): Proceed in the same way but hold the adjusting nut (5) with spanner 1699-T and slacken the locknut (12) with spanner 1982-T (see Pl. 25, fig. 1)	Spanner 1699-T Spanner 1982-T
4	Lower car to ground.	
5	Check the tightness of the nuts (1) securing the brackets (2) (see fig. 2)	23 mm box spanner

PARTICULAR POINTS.

Replacement of an upper front crossmember.

Assembly.

10 *Insert shims between the crossmember and sidemembers. The distance between the brake disc and the sidemember, on the left hand side, must be 70 ± 2 mm greater than this same distance on the right hand side.*

16 *Fill the radiator.*

Replacement of a rear flexible mounting (cars produced until July 1959).

Dismantling.

The threaded shaft must be removed from underneath the car, while the flexible mounting must be removed from above the car. Before carrying out these operations, measure the distance "a" (see Pl.25) between the bearing face of the engine support arm at the level of the top nut, and the face of the flexible mounting which bears against the steel plate support fixed to the body.

Assembly.

30 to 33 *Insert the threaded shaft (fitted with parts comprising the lower assembly), from underneath the car, into the flexible mounting and tighten the top nut of the engine support arm, untill the distance "a" measured during dismantling has been obtained.*

37 *Check the adjustment of the engine mountings (see Op.ID 133–0).*

Replacement of a rear flexible mounting (cars produced since July 1959).

The flexible mounting and the rear engine support must be removed together.

Pre-adjustment of a rear flexible mounting (cars produced until July 1959).

40 *Place the rubber washer against the flexible mounting support and tighten the lower cupped nut eight turns (10 mm).*

Pre-adjustment of a rear flexible mounting (cars produced since July 1959).

Adjust the lower nut, to obtain a distance of 98 mm between the upper face of this nut and the lower face of the flexible mounting which bears against the support fixed to the body.

Replacement of a rear support (cars produced until July 1959).

Dismantling.

The flexible mounting must be removed with its threaded shaft (see above).

Assembly.

Lower the engine, then move the support and flexible mounting, to centralise these parts in relation to the engine support arm.
Check the adjustment of the engine mountings (see Op.ID 133–0).

Replacement of a rear support (cars produced after July 1959).

The flexible mounting and rear engine support must be removed together.

REPLACEMENT OF AN UPPER FRONT CROSSMEMBER

Removal.

		TOOLS
1	Drain the radiator, retaining the water which contains anti-freeze.	
2	Remove the front wings, the spare wheel and the support bar	12-14 mm spanner and box spanner
3	Remove the battery, the battery tray, the battery support bracket and the straps holding the hydraulic fluid tank	8-12 mm box spanners
4	Remove the radiator tie-bar. Disconnect the water pump delivery hose from the radiator and disconnect the hose between the radiator and the steel pipe from the steel pipe	8-12 mm box spanners
5	Remove the screws securing radiator to lower front crossmember. Remove the distance pieces. Remove the radiator	12-14 mm box spanners
6	Pass a covered chain (chain 1697-T, see Pl. 42) round the water pump cover and support the engine and gearbox-assembly either by means of a stand (stand 1797-T, see Pl. 42) or by means of a pulley block	Chain 1697-T Stand 1797-T
7	Remove the caps of the flexible half-collars between the upper and lower crossmembers, and remove the upper flexible half-collars	14 mm box spanners
8	Remove the screws securing the upper corssmember to the sidemembers and remove the crossmember. Withdraw the adjusting shims between crossmember and sidemember	14 mm box spanners

		TOOLS
	Refitting.	
9	Slightly raise the engine and gearbox assembly, then place the upper crossmember in position. Place the upper flexible half collars and caps in position. Insert and tighten the screws securing the crossmember on the bracket arms, inserting locking tabs and turning them down on the screws	14 mm box spanner
10	Lower the engine and gearbox assembly until the crossmember rests on the sidemembers. The distance between the brake disc and the sidemember, on the left-hand side, must be 70 ± 2 mm greater than this same distance measured on the right-hand side. Insert the number of shims required to obtain this difference, between the crossmember and sidemembers. The crossmember must be a good fit between the sidemembers. Tighten the screws securing the crossmember to the sidemembers (plain and spring washers under the heads of screws). Withdraw the chain and remove the stand	14 mm box spanner
11	Make sure that the rubber blocks are in position on the supports on the crossmember and place the radiator in position. Couple the hoses and tighten the clips. Place the distance piece between the exhaust downpipe bracket and the radiator. Insert the fixing screws and centre the radiator; the fan blades must not touch the cowling. Tighten the radiator fixing screws (plain washers under screw heads)	14 mm box spanner
12	Fit the radiator bie-bar. Tighten the fixing bolt and nut (plain and spring washers)	12 mm spanner and box spanner 8 mm box spanner
13	Fit the battery bracket. Tighten the fixing screws (plain and spring washers under the screw heads), insert the distance piece between battery bracket and the gearbox support crossmember	12 mm box spanner
14	Fit the front wings, the spare wheel support bar and the spare wheel	12-14 mm spanners and box spanners
15	Fill the radiator.	

REPLACEMENT OF A FRONT SUPPORT ARM.

Removal (see Pl. 45).

16 Remove the differential shaft bearing, differential shaft, support arm, flexible coupling (Bibax) assembly, Left-hand side, or the differential shaft bearing, differential shaft and support arm assembly, right-hand side (see Op. ID 330-4).

		TOOLS
17	Unscrew the retaining screw (56) from the locknut (57) of the differential bearing (58) and remove nut (57) (spanner 1770-T, see Pl. 55, fig. 4)	7 mm box spanner Spanner 1770-T
18	Drive out the disc and shaft assembly. Remove the bearing support bracket (2).	
	To refit (see Pl. 45).	
19	Put the bracket (2) on the differential shaft bearing. Place the bearing and bracket on the differential shaft. Force in position using a tube in a press. Pay attention to the centring dowel on the differential shaft	Tube dia. = 30 x 39 mm, length = 200 mm
20	Tighten the locknut (57) of the shaft bearing (58) to 72 ft. lbs (10 m. kg) (spanner 1770-T, see Pl. 55, fig. 4). Tighten the retaining screw (56) of the nut (57)	7 mm box spanner Spanner 1770-T
21	Fit the differential shaft and bearing assembly (see Op. ID 330-4).	
	REPLACEMENT OF A REAR FLEXIBLE MOUNTING (Cars produced until July 1959).	
	Removal (see Pl. 25).	
22	Jack up the front of the vehicle (jacking bracket 2505-T, see Pl. 111)	Jacking bracket 2505-T
23	Left-hand side : disconnect the distributor return spring. Right-hand side : remove the exhaust manifold screen	12 mm box spanner
24	Remove the upper fixing nut (1) from the arm (2)	23 mm box spanner
25	Pass a covered chain sling (sling 1697-T, see Pl. 42) round the water pump cover and suspend the engine on a chain block Measure the distance "a" between the bearing face "b" of the arm on nut (3) and the bearing face "c" of the flexible block on the support plate (4). Remove the lower fixing nut (3) from the arm (2)	Sling 1697-T 23 mm box spanner
26	Using suitable means, hold the locknut (5) from beneath the car (spanner 1700-T, see fig. 3) and remove nut (6) and cup (7)	Spanner 1700-T
27	Withdraw the spindle (8) with the rubber washer and fibre washer (9), the rubber block (11), the cupped nut (5) and the locknut (12) from underneath the car.	
28	Remove the flexible mounting (13) together with the spacer (14). Remove the spacer from the flexible mounting	

		TOOLS
	Refitting (see Pl. 25).	
29	Place the flexible mounting on the support plate (4) fitted with the spacer (14) and the cup plate (15).	
30	Insert the spindle (8) complete with the rubber and fibre washer (9), the rubber block (11), the cupped nut (5) and the locknut (12), in the flexible mounting.	
31	Place the cup (7) in position and tighten the nut (6). Have the cupped nut (5) firmly held from underneath the car by an assistant (spanner 1700-T, see fig. 3)	23 mm box spanner Spanner 1700-T
32	Tighten the lower nut (3) on the arm (2) until the measurement "a" measured in paragraph 25 is obtained.	
33	Engage the spindle (8) in the bore in the arm (2). Gently lower the engine and engage the spigot on the lower fixing nut (3) in the bore in the arm (2).	
34	Insert and tighten the screws securing the flexible mounting on the support (4). Tighten the upper fixing nut (1) on the arm (2)	14-23 mm box spanners
35	Left-hand side : hook on the distributor return spring. Right-hand side : fit the exhaust manifold screen. Tighten the fixing screws (plain washers under heads)	12 mm box spanner
36	Lower the car to ground (jacking stand 2505-T, see Pl. 111). Remove the sling 1697-T. Check the adjustment of the engine mounting. Re-adjust if necessary (see Op. ID 133-0)	Jacking stand 2505-T
	REPLACEMENT OF A REAR FLEXIBLE MOUNTING (cars produced since July 1959).	
	Dismantling.	
37	Left-hand side : disconnect the distributor return spring. Right-hand side : remove the exhaust manifold screen	12 mm box spanner
38	Pass a covered chain sling (sling 1697-T, see Pl. 42) round the water pump cover and suspend the engine on a chain block	Sling 1697-T
39	Remove the screws securing the support arm to the engine and the screws securing the flexible mounting to the support fixed to the body. Remove the flexible mounting and support arm assembly	14-17 mm spanners and box spanners
40	Remove the upper nut securing the arm to the flexible mounting and release the arm from the flexible mounting . No work can be carried out on the flexible mounting.	23 mm box spanner

		TOOLS
	Assembly.	
41	Fit the arm on the previously adjusted flexible mounting (see paragraph 49) and screw the upper nut securing the arm (lockwasher)	23 mm box spanner
42	Fit the flexible mounting and support arm assembly on the engine. Fit and tighten the screws securing the flexible mounting and the support arm, after placing correctly the following parts (spring washer under the heads of the screws securing the arm, plain and spring washers under the heads of the screws securing the flexible mounting)	14-17 mm spanners and box spanners
43	Left-hand side : hook on the distributor return spring. Right-hand side : fit the exhaust manifold screen. Tighten the fixing screws (plain washer under the head of the screw)	12 mm box spanner

REPAIRING A FLEXIBLE ENGINE MOUNTING (cars delivered until July 1959)

	Dismantling (see Pl. 25).	
44	Remove the spindle (8), the rubber and fibre washer (9), the rubber block (11), the locknut (12) and the cupped nut (5). Clean the parts.	
	Fitting (see Pl. 24).	
45	On the spindle (8) fit the rubber and fibre washer (9), the rubber block (11), the cupper nut (5) and the locknut (12).	

PRE-ADJUSTMENT OF THE REAR FLEXIBLE ENGINE MOUNTING (cars delivered until July 1959) (see Pl. 25).

46	Tighten the cupped nut (5) until the rubber washer (9) comes into contact with the face "d" of the support (4). The washer (9) must turn freely without play	23 mm box spanner
47	Holding the spindle (8) by the nut (6) fixing the cup (7), tighten the cupped nut (5) giving it eight complete turns, which corresponds to a movement of 10 mm	23 mm spanner and box spanner
48	Tighten the lock and locknut (12)	23 mm spanner and box spanner

		TOOLS
	PRE-ADJUSTMENT OF A REAR FLEXIBLE MOUNTING (cars delivered since July 1959).	
49	Bring the upper face of the lower nut securing the arm to a distance of 98 mm from the face of the flexible mounting which bears against the steel plate support fixed to the body	21 mm spanner
	REPLACEMENT OF A REAR ARM (cars delivered until July 1959).	
	Removal (see Pl. 25).	
50	Jack up the front of the vehicle (jacking stand 2505-T, see Pl. 111)	Jacking stand 2505-T
51	Left-hand support arm : release the distributor spring. Right-hand support arm : remove the exhaust manifold screen	12 mm box spanner
52	Remove the upper fixing nut (1) of the arm (2) on the flexible mounting (13)	23 mm box spanner
53	Place a covered chain sling round the water pump cover (chain sling 1697-T, see Pl. 42) and support the engine on a chain block	Chain sling 1697-T
54	Remove the screws fixing the rear arm (2) and withdraw the arm	14 mm spanner 17 mm spanner and box spanner
	Refitting (see Pl. 25).	
55	Place the rear arm (2) in position and tighten the fixing screws (spring washers)	14-17 mm spanners and box spanners
56	Engage the spindle (8) in the bore of the arm (2). Lower the engine slightly and engage the spigot of the nut (3) in the bore in the arm (2). Tighten the upper nut (1)	23 mm box spanner
57	Left-hand side : hook on the distributor return spring. Right-hand side : fit the exhaust manifold screen	12 mm box spanner
58	Lower the car to the ground (jacking stand 2505-T, see Pl. 111). Remove the chain sling 1697-T	Jacking stand 2505-T
	REPLACEMENT OF A REAR ARM (cars delivered since July 1959).	
59	Proceed in the manner indicated for the replacement of a flexible mounting (see paragraphs 37 and following, this operation).	

REPLACEMENT OF A REAR FLEXIBLE MOUNTING BRACKET (cars delivered until July 1959).

		TOOLS
	Removal (see Pl. 25).	
60	Remove the spindle of the flexible mounting (see paragraphs 22 to 27, this operation).	
61	Remove the screws securing the flexible mounting (13) on the support (4) and remove the flexible mounting	14 mm box spanner
62	Remove the nuts fixing the support (4) and remove the support	14 mm spanner
	Refitting (see Pl. 25).	
63	Place the support in position, screw on the fixing nuts without tightening them (plain and spring washers).	
64	Place the elastic block on the bracket and insert the fixing screws without tightening them (plain and spring washers under screw heads).	
65	Engage the spindle (8) complete with the rubber and fibre washer (9), the rubber block (11), the cupped nut (5) and the locknut (12) in the flexible mounting (13).	
66	Place the cup (7) in position and tighten the nut (6). Have the locknut (5) firmly held from beneath the car by an assistant (spanner 1700-T, see fig. 3)	Spanner 1700-T 23 mm box spanner
67	Tighten the lower fixing nut (3) of the arm (2) until the measurement "a" mentioned in paragraph 25 is obtained.	
68	Engage the spindle (8) in the bore of arm (2). Gently lower the engine and engage spigot of the nut (3) in the bore in arm (2). Fit and tighten the upper fixing nut (1) on the arm (2)	23 mm box spanner
69	Tighten the screws securing flexible mounting (13) on the support (4) (plain and spring washers) and tighten the fixing nuts of the support (4) on the body (plain and spring washers)	14 mm spanner and box spanner
70	Left-hand side : replace distributor return spring. Right-hand side : fit exhaust manifold screen. Tighten the fixing screws (plain washers under heads)	12 mm box spanner
71	Lower the car to the ground (jacking stand 2505-T, see Pl. 111). Remove the chain sling 1697-T	Jacking stand 2505-T
72	Check the adjustment of the engine mounting. Re-adjust if necessary (see Op. ID 133-0).	

		TOOLS
	REMOVAL	
1	Drain the radiator, retaining the water which contains anti-freeze.	
2	Remove the carburettor (see Op. ID 142-1, paragraphs 1 to 4).	
3	Disconnect the heating pipe from the inlet manifold. Remove the inlet manifold and the gasket between inlet manifold and cylinder head	12 mm box spanner
4	To strip the inlet manifold : Remove the petrol outlet pipe and the biconical union between pipe and manifold. Remove the fixing sleeve of the heating pipe and the fibre joint. Remove the cover plate of the inlet manifold	12 mm spanner 12-19 mm box spanners
	REFITTING	
5	To assemble the inlet manifold : Place the cover plate in position and insert a gasket smeared with "Hermetic". Fit the fixing sleeve of the heating tube and insert the fibre gasket. Fit the petrol outlet pipe using a biconical union	12 mm spanner 12-19 mm box spanners
6	Fit the inlet manifold on the cylinder head, inserting a Hugo Reinz gasket; tighten the fixing screw (plain washers under heads). Connect the heating pipe to the inlet manifold inserting an elastic ring and tighten collar.	12 mm box spanner
7	Fit the carburettor (see Op. ID 142-1, paragraphs 5 to 10).	
8	Fill the radiator with the engine running.	

TOOLS

REPLACEMENT OF A SOLEX 34 PBIC CARBURETTOR

Removal.

1 Unscrew the clip on the carburettor securing the tube between the air filter and carburettor and remove the tube.

2 Disconnect the choke control and the accelerator control cable .... 8 mm box spanner

3 Disconnect the flexible petrol inlet pipe to the carburettor and disconnect the vacuum pipe union.

4 Remove the carburettor fixing nuts, remove the carburettor (spanner 1645-T, see Pl. 16, fig. 3). Remove the fibre gasket .... Spanner 1645-T

Refitting.

5 Fit the carburettor, inserting the fibre gasket.

6 Slightly raise the carburettor in order to fit the fixing nuts (use spring washers). Tighten the nuts (spanner 1645-T, see Pl. 16, fig. 3) .... Spanner 1645-T

7 Connect the accelerator control cable. Adjust the control (see Op. ID 142-4, paragraphs 9 to 11) .... 8 mm box spanner

8 Connect the choke control. Make sure that the choke opens and closes correctly.

9 Connect the union for the vacuum pipe and the flexible petrol inlet pipe to the carburettor.

10 Connect the tube between the air filter and carburettor to the carburettor. Tighten the clip.

11 To adjust the slow running (see Pl. 26).

The slow running adjustment is made as follows :

a) By turning the regulating screw (4) of the butterfly which varies the speed of the engine.

b) By setting the mixture control screw (29) which controls the volume of petrol delivered to the slow running jet (25). Since this screw is very sensitive in adjustment it should only be turned very gradually.
If the engine "races" the mixture is too rich; screw (29) therefore must be tightened.
If the engine hunts and "stops" easily, a richer mixture must be injected by screwing out the screw (29).

The fuel volume control screw (29) must never be screwed right home.

PARTICULAR POINTS

If the diaphragm of the accelerator pump is damaged, replace the pump (do not remove the diaphragm).

		TOOLS
	DISMANTLING (see Pl. 26).	
1	Remove the spring (1) of the throttle control (2) controlling the opening of the throttle and disconnect the throttle control (2) from the carburettor. Remove the support (3) of the throttle stop screw (4) and (5) and remove the washer (6)	12 mm box spanner
2	Remove the top float chamber cover (7) from the carburettor. Remove the paper gasket. Remove the needle valve (8) and filter plug (9) from the top of the cover	9-12-14 mm box spanner
3	Remove the float (10) and its spindle (11) from the carburettor.	
4	Remove the screws, remove the injector (12) and paper gasket. Remove the air correction jet (13), and withdraw the emulsion tube (14).	
5	Remove the choke tube locking screw and remove the choke tube (15).	
6	Remove the accelerating pump (16) from the carburettor body.	
7	Remove the pump lever pin (17), remove the spring (18) and washer (19). Disconnect the accelerator pump (secured by four screws) from the carburettor and withdraw the gasket.	
	IMPORTANT - If a pump diaphragm is damaged, fit a new pump. Never remove the diaphragm.	
8	Remove the main ject carrier (20) and remove the main jet (21) from the carrier (20). Remove the starter petrol jet (22) and the starter air jet (23). Remove the pump jet (24), the pilot jet (25) and the idling air bleed (26)	8-12-14 mm box spanner
9	Remove the seat (27) of the pump inlet valve ball (28). Remove the volume control screw (29)	12 mm box spanner
10	Clean the parts, blow compressed air through the ducts and the jets. Thoroughly clean the filter plug (9) and the filter (30) of the pump valves (28). Never use a metal wire for cleaning the jets.	
	ASSEMBLY (See Pl. 26).	
11	Fit the filter plug (9) and fit the needle valve (8), inserting a copper gasket	12-14 mm box spanners

		TOOLS
12	Insert provisionally the volume control screw (29). Fit the pump inlet valve (28) together with its filter (30) and insert a copper gasket	12 mm box spanner
13	Screw in the idling air bleed (26), the pilot jet (25) and the pump jet (24) (insert a copper washer).	
14	Screw in the starter air jet (23) and the starter petrol jet (22) (insert a copper washer). Screw the main jet (21) into the carrier (20) and fit the carrier (20) inserting a fibre washer	12-14 mm box spanners
15	Fit the accelerator pump inserting the gasket. Fit the washer (19) and the spring (18) and place the pin of pump lever (17) in position.	
16	Fit the throttle (16) on the carburettor body.	
17	Fit the choke tube (15), tighten the locking screw. Fit the pump injector (12), insert a paper joint and tighten the screw. Place the emulsion tube (14) in position and screw up the air corrector jet (13).	
18	Fit the float (10) in position complete with its spindle (11). Fit the cover paper gasket. Secure the float chamber cover (7) to the carburettor body. Tighten the fixing screws (spring washers under heads)	9 mm box spanner
19	Fit the washer (6), the bracket (3) for the set screws and fit screw (4 and 5) and the throttle control (2). Tighten the nut. Fit and load the spring (1)	12 mm box spanner

The adjustment of Solex 34 PBIC carburettor is as follows :-

Type	Choke	Main Jet	Air Correction Jet	Emulsion Tube	Pilot		Starter		Float Weight	Needle	Pump Jet
					Air Jet	Fuel Jet	Air Jet	Fuel Jet			
FRANCE	26	125	175	19	150	50	4	115	5.7 g	2	50
EXPORT	26	135	230	28	150	50	4	115	5.7 g	2	50

We strongly advise against any interference with this adjustment which was arrived at after many tests.

PARTICULAR POINTS.

Replacement of an accelerator cable.

Adjustment (see Pl. 27).

11 *With the pedal up, the throttle valve must be closed.*

With the throttle valve fully open, the distance "a" must be equal to 0 to 4 mm between the accelerator rod and the carpet.

Replacement of an accelerator pedal.

Adjustment (see Pl. 27).

15 *The distance "b" between the threaded end of the screw and the inside of the pedal bracket should be 0 to 1 mm and the distance "c" between the pedal bearing and the locknut of the screw should be 0·2 to 1·7 mm.*

16 *Make sure that the cable is located in the centre of the sleeve welded on the body, if not set the pedal rod in the area "d".*

		TOOLS
	REPLACEMENT OF AN ACCELERATOR CABLE	
	Removal (see Pl. 27).	
1	Disconnect the cable (1) from the control cam (2)	8 mm box spanner
2	Remove the stop (3) for the outer casing, the outer casing (4) and the stop (15) for the outer casing.	
3	Remove the pin (5) and washer (6) from the pedal rod.	
4	Remove the cable (1), spring (7) and damper body (9) assembly from the pedal rod.	
5	Remove the damper body, the cable and springs assembly.	
	Refitting (see Pl. 27).	
6	Assemble in the damper body (9), the spring (7) and the cable (1).	
7	Position the assembly on the pedal rod, engage the end of the rod (10) in the damper body. Put the washer (6) and pin (5) into position.	
8	Fit the cable (1), the stop (15), the outer casing (4) and the outer casing stop (3) (only refit a nylon stop).	
	On cars produced until February 1958, bore the sleeve (11) to 6.5 mm diameter, in order to fit the stop (15).	

TOOLS

9 Hold the pedal up, with the front end of the damper body (9) against the rubber stop (8).

10 Connect the cable (1) to the control cam (2) .... 8 mm box spanner

11 To adjust the accelerator cable :

a) With the pedal up (the damper body against the rubber stop) the throttle valve must be completely closed.

b) With the throttle valve fully open, the distance "a" must be equal to 4 mm at maximum.

REPLACEMENT OF AN ACCELERATOR PEDAL

Removal (see Pl. 27).

12 Remove the cable (1) the outer casing (4) and damper assembly (9) from the accelerator pedal (see this operation, paragraphs 1 to 4).

13 Remove the pedal; undo the locknut (12) and unscrew the threaded spindle (13) and withdraw the pedal (10), locknut (12) and threaded spindle (13) .... 17 mm spanner

Refitting (see Pl. 27).

14 Fit the threaded spindle (13), after first coating with grease (graphite grease), on the pedal bracket. Place the locknut (12) against the pedal bracket and insert the screw (13) into the locknut.

15 Place the pedal in position and screw the threaded spindle (13) into the pedal bearing (14), holding the locknut (12) against the pedal bracket until the distance "b" is between 0 and 1 mm. Lock the locknut (12) against the pedal bracket; the distance "c" between the locknut (12) and the accelerator pedal bearing (14) should then be between 0.2 and 1.7 mm .... 17 mm spanner

16 Fit the cable, outer casing and damper assembly on the pedal (see this operation, paragraphs 6 and 11). Make sure that the cable (1) is located in the centre of the outer casing sleeve (11). If necessary set the pedal rod at "d" in order to effect this.

REPLACEMENT OF A CHOKE CONTROL

Removal.

17 Undo the cable fixing screw and the screw fixing the outer casing on the carburettor. Remove the cable and outer casing assembly from the carburettor .... 8 mm spanner and box spanner

18 Remove the glove box fixing screws. Remove the glove box.

		TOOLS
19	Holding the outer casing ferrule in position, unscrew the fixing nut on the choke control. Withdraw the choke control, the fixing nut and the spring washer	12-14 mm spanners
	Refitting.	
20	Make sure that the plain (chrome-plated) washer is in position on the outer casing ferrule. Insert the cable and outer casing on the facia panel, fit the spring washer and the fixing nut for the outer casing ferrule on the choke control. Insert the cable and cable outer casing through the rubber ring on the bulkhead. Tighten the fixing nut securing the choke control on the facia panel	12-14 mm spanners
21	Fit the glove box. Tighten the fixing screws.	
22	Connect the throttle control to the carburettor. Lightly tighten the screw securing the outer casing to the carburettor. Tighten the cable fixing screws. Make sure that the choke opens and closes correctly	8 mm spanners and box spanners

OPERATION No. ID 171-1 : *Replacement of an air filter*

		TOOLS
	REMOVAL.	
1	Remove the fixing clip on the air filter from the tube between the air filter and the carburettor. Disconnect the tube from the filter.	
2	Remove the nuts fixing the air filter. Remove the air filter	12-17 mm box spanners
	REFITTING.	
3	Place the air filter in position. Connect the tube between the filter and the carburettor to the air filter.	
4	Tighten the nuts fixing the air filter (spring washers). Tighten the clip securing the tube to the air filter	12-17 mm box spanners

OVERHAULING A VOKES AIR FILTER (see Pl. 29).

Dismantling.

NOTE - It is essential to clean the filter element every 3,750 miles (6,000 kms) (car operating in normal road conditions).

1 Undo the winged nut (1), remove the end cover (2), withdraw the inner tube assembly (3) complete with filter element (4). Withdraw the filter element (4) from the tube (3). Remove the felt joints (6), (7) and (8).

2 Clean the components. Holding the filter element vertical, remove dust by tapping it gently at the edges with the hand.

Assembly.

3 Fit the filter element (4). Fit the felt joints (6), (7) on the pipe and inner tube assembly (3).

Insert these components into the air filter body (5). Replace the cover (2) complete with felt joint (8). Arrange the position of the rear fixing bracket (9) in relation to the front fixing bracket (10) and tighten the wing nut (1) (plain washer).

Ensure that the felt joints are glued in position. If not, glue them again with glue EC 847, sold by the Societe MINNESOTA de FRANCE, 135, boulevard Serrurier, Paris (19e). Telephone No. BOL 71-79 and BOT.42-80.

NOTE - For efficient operation the edges of the filter element must be correctly seated on the felt gaskets (7 and 8). Make sure that the element is sufficiently compressed by the cover, if not, insert a second felt gasket (7), which should be stuck to the first (EC 847 glue).

OVERHAULING A MIOFILTER FILTER (see Pl. 28).

Dismantling.

NOTE - It is essential to clean the filter element every 3,750 miles (6,000 kms) (car operating in normal road conditions).

4 Unscrew the wing nut (1) and remove the serrated washer (2).
Remove the front cover (3) complete with felt joint (4) and withdraw the filter element (5) complete with cork gaskets (9).

5 Remove the rear cover and pipe assembly (6) from the air filter body (7).
Remove the felt joint (8) from the rear cover and pipe assembly (6).

6 Clean the components. Wash the filter element (5) in petrol and then dip it in engine oil and leave it to drain.
Brush the filter element (5) and blow it with compressed air.

TOOLS

Assembly.

7 Ensure that the felt joint (8) is glued satisfactorily on the rear cover. If it is not, glue it again (glue EC 847, see paragraph 3, this operation). Place the rear cover and pipe assembly (6) in the body of the air filter (7). Fit the front cover (3) complete with felt gasket (4).

8 Arrange the rear fixing bracket (10) in relation to the front bracket (11). Tighten the wing nut (1), fitting the serrated washer (2).

Make sure that the filter element (5) is properly seated on the felt joint (4); if not, insert a second felt joint, which should be stuck to the first (glue EC 847).

		TOOLS
	REMOVAL.	
1	Disconnect the inlet and outlet pipes from the pump.	
2	Remove the fixing nuts and remove the pump Remove the gasket.	14 mm box spanner
	TO FIT.	
3	Position the cork gasket and the pump on the pump bearing face on the crankcase. Tighten the fixing nuts (spring washers)	14 mm box spanner
4	Connect the inlet and outlet pipes to the pump.	
5	Using the lever, prime the pump.	

PARTICULAR POINTS.

3 *If the valves are not functioning correctly, replace the pump (valve seats in the cover).*

7 *The diaphragms must be fitted dry (important).*

12 *Immerse the pump in a container filled with clean petrol, no leak should occur when compressed air is injected through the rubber feed pipe at a pressure of 1½ to 4½ p.s.i. (100 to 300 g/cm²).*

		TOOLS
	DISMANTLING (see Pl. 30).	
1	Remove the bowl (1), remove the filter (2) and withdraw the bowl gasket (3).	
2	Disconnect the upper part (4) of the pump from the body (5). Drive out the priming lever fulcrum (6). Remove the diaphragm assembly (7) and push-rod (8).	
3	Undo the nut (9), withdraw the serrated washer. From the rod (8), remove the upper thrust washer (10), the set of 4 diaphragms (7), the lower thrust washer (11), the gasket (12), the spring (13), the cup (14), the gasket (15), the cap thrust washer (16) and sealing cap (17)	10 mm spanner
	NOTE - The inlet and outlet valve seats are incorporated in the pump cover. If the valves do not function properly, the pump must be replaced.	
4	Clean the components.	
	ASSEMBLY (see Pl. 30).	
5	Fit the sealing cap (17) on the push-rod (8). Then place on the rod (8): the cap thrust washer (16), the gasket (15), the cup (14), the gasket (12), the spring (13), the end with the larger diameter on the washer (16). Place in position the lower thrust washer (11), the set of 4 diaphragms (7), the upper thrust washer (10) and a serrated washer and screw on nut (9) without tightening it.	
6	Introduce the diaphragm and push-rod assembly into the body of the pump. Fit the priming lever, insert the fulcrum (6) and crimp slightly.	
7	Make sure that the holes in the diaphragms for the screws are aligned with the threaded bores in the pump body. Tighten the nut (9)	10 mm spanner
	Secure the upper part (4) of the pump to the pump body (5). *The diaphragms must be fitted dry, no hermetic compound or seal material should be used.*	
	Tighten the assembly screws without using washers.	

TOOLS

8 Place the bowl gasket (3) in position. Fit the filter element (2). Fit the bowl (1) and tighten the clamp nut.

9 Check the pump for leaks (see paragraphs 10 and following).

CHECKING THE PUMP FOR LEAKS (see Pl. 31).

10 Close the outlet pipe to carburettor with a plug.

Fit a rubber hose on the inlet opening.

11 Immerse the whole pump in a container filled with clean petrol.

12 Blow compressed air at a pressure of $1\frac{1}{2}$ to $4\frac{1}{2}$ p.s.i. (100 to 300 g/cm^2) through the rubber petrol hose. At the beginning there may be a few bubbles due to movement of the diaphragms.

Maintain the pressure for a short period.

If bubbles of air continue to escape through the priming lever opening at "a", it means that the diaphragm is leaking and must be replaced.

If bubbles of air escape between the mating faces of the cover and the pump body or at the locking screws at "b", the gasket surfaces are defective or the screws have not been sufficiently tightened.

If bubbles of air escape between the bowl and the cover at "c", the joint is defective or the bowl has not been adequately tightened.

		TOOLS
	REMOVAL.	
1	Jack up the front of the car on wedges (jacking support 2505-T, see Pl. 111). Remove the right-hand front wing and the side protection plate	Jacking support 2505-T 8-12-14 mm box spanners
2	Remove the lower right-hand sidemember closing panels.	
3	Undo the fixing screws and remove the rubber protectors from the straps securing the petrol feed pipe to the right-hand sidemember and sill and to the front crossmember under the engine (lower part). Withdraw the pipe from the straps	8 mm box spanner
4	Remove the squab and rear seat. Remove the petrol tank cover plate	12 mm box spanner
5	Remove the petrol feed pipe together with the rubber hose from the tank and from the opening on the rear part of the sidemember.	
6	Remove the rubber connecting tube to tank from the petrol feed pipe. Disconnect the front rubber union from the petrol pump and remove the union from the feed pipe.	
7	Disconnect the front part of the feed pipe from the front crossmember under the engine, from the right-hand sill and from the front closing panel of the right-hand sidemember.	
8	Disengage the pipe from the sidemember by pulling it towards the front.	
	REFITTING.	
9	Close the front and rear openings in the petrol feed pipe. Drain the tank	21 mm box spanner
10	Engage the rear part of the pipe in the hole in the front closing panel of the right-hand sidemember, fit the pipe in the straps on the sidemember.	
11	With the narrow part of the feed pipe towards the rear, slide on the rubber connecting pipe towards the front of the narrow part of the feed pipe, with the rear end of the rubber pipe 370 mm from the rear end of the feed pipe, Use talc only for sliding the pipes.	
12	Insert the rear end of the feed pipe in the tank and carefully couple the rear end of the rubber hose on the tank connection. Cut the rear end of the feed tube obliquely and insert the drain plug (insert the seal)	21 mm box spanner
13	Fit the petrol tank cover plate. Tighten the fixing screws (plain washers under the heads). Paste the sill trimming (Glutafix T paste, sold by Messrs. Bessier, 125, Rue de Reuilly, Paris 12^{e}) on the petrol tank cover plate. Put the rear squab and seat in position	12 mm box spanner

		TOOLS
14	Place the feed pipe under the straps on the right-hand sidemember. Insert the rubber protectors. Tighten the fixing screws of the straps	8 mm box spanner
15	Fit the lower closing panels of the right-hand sidemember. Tighten the fixing screws (plain washers under the heads).	
16	Place the front part of the feed pipe against the front sidemember closing panel, behind the front axle arm bracket, against the sill and in the front crossmember under the engine. Then insert the pipe through the opening on the left-hand side of the lower part of the crossmember.	
17	Place in position the rubber coupling sleeve to the petrol pump on the front end of the feed pipe. Fit the pipe in the rubber sleeve using talc to facilitate the work. Couple the sleeve to the petrol pump.	
18	Place the feed pipe in the straps on the front closing panel of the sidemember, the front crossmember under the engine and insert the rubber protectors. Tighten the strap fixing screws	8 mm box spanner
19	Fit the side protection plate and the right-hand front wing. Lower the vehicle to the ground (jacking support 2505-T, see Pl. 111).	
	Fill the tank and prime the petrol pump using the manual control	Jacking support 2505-T 8-12-14 mm box spanners
	IMPORTANT NOTE - In the event of any leakage from the connection pipe to the tank, make sure that there is a tight joint between the rubber hose and the tank and between the rubber hose and the nylon hose by using 2 Ligarex clips located as shown in Pl. 30, fig. 3). Tighten the clips moderately in order to avoid deformation of the nylon pipe (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T

TOOLS

NOTE - This repair can be carried out by fitting a sleeveon the pipe system (petrol feed or suspension by-pass return) or by replacing one of the unions (by-pass return).

If two sleeves have to be fitted on the same pipe, they must be about 800 mm apart in order to retain the flexibility of pipe system.

The flexible pipes and Rilsan unions are sold by our Spare Parts Department :

Overflow return pipe for the height corrector (since January 1957), pipe diameter 3 x 4 mm, length = 470 mm	No. DM 211-14a
Pipe diameter 3 x 4 mm, length = 900 mm	No. DM 211-14
Petrol system, pipe diameter 6 x 8, length = 1 metre	No. DS 391-151
Suspension by-pass return pipe, diameter 8 x 10, length = 1 metre	No. DS 391-152
"T" union for right-hand front suspension cylinder by-pass return pipe	No. DS 391-148
"Y" union for right-hand rear suspension cylinder by-pass return	No. DS 391-149
"T" union securing return rubber hose to petrol tank	No. DS 391-146

NOTE - The unions are sold complete with 60 mm pipe on each outlet.

Likewise obtain a bottle (60 cm^3) Rilsan glue, sold by Messrs. Boyriven, 37 bis, rue de Villiers, Neuilly-sur-Seine.

1 After trimming the pipes remove the polish from the ends of the pipe system, for a length of about 90 mm or remove the polish from the union outlets using emery paper No. 600.

2 Carefully remove all grease from the rubbed down ends, with trichlorethylene and do the same to the sleeve.

3 Heat the Rilsan paste in a bath and bring it to a temperature of 60°C. (Do not heat beyond this temperature).

This operation is essential to reduce the hardening period.

IMPORTANT NOTE - Rilsan paste attacks the skin and must not be touched with the fingers.

Rilsan paste destroys the bristles of nylon or Rilsan brushes; use a wooden stick or spatula.

4 a) Smear the ground ends of the pipes and the inside of the unions with paste.

b) Let the parts dry for a few minutes.

c) Insert the ends of the pipes or the union outlets in the sleeves.

d) Leave the assembly for 3 to 4 hours to dry before using the repaired pipe.

PARTICULAR POINTS.

In the case of any leakage from the connection pipe to the tank, make sure that there is a tight joint by using two Ligarex clips located as shown on Pl.30, fig. 3. Tighten the clips moderately in order to avoid deformation of the nylon pipe.

REPLACEMENT OF A PETROL TANK

Removal.

		TOOLS
1	Drain the tank (2 plugs)	12-21 mm box spanners
2	Lift and remove the rear squab. Remove the rear seat. Remove the petrol tank cover plate	12 mm box spanner
3	Disconnect the flexible air vent hose from the tank. Close the orifices of the hose and tank.	
4	Remove the rear closing panel under the right-hand sidemember. Remove the fixing strap of the rear flexible hose of the petrol pump feed pipe. Disconnect the flexible hose and remove the petrol feed pipe from the tank. Block the orifices of the pipe and the tank	7 mm box spanner
5	Remove the right-hand rear wing. Remove the right-hand rear side protection panel. Carefully clean the area where work is to be done round the flexible hose between the filler pipe and tank. Remove the front collar from the flexible hose between the filling pipe and the tank. Disconnect the flexible hose from the tank. Close the openings of the tank and the pipe	8 mm spanner and box spanner 14 mm box spanner
6	Remove the negative cable from the battery. Disconnect the leads from the tank unit gauge terminals.	
7	Turn back the clips securing the transverse packings of the tank and remove the packings.	
8	Undo the fixing screws of the tank fixing straps and remove the straps and the rear rubber packings. Remove the tank.	
9	To strip the tank : Remove the gauge tank unit. Remove the rubber sound-insulating blocks. Remove the tank protection packings.	

		TOOLS
	Refitting.	
10	To assemble the tank :	
	a) Place the gauge tank unit in position, inserting a rubber gasket. Tighten the fixing screws (fibre washers under heads).	
	b) Fit and glue (Bostick) the rubber sound-insulating blocks in position at the back and front of the tank (one block about 100 mm from the left-hand end of the tank, one block in the centre and one block about 150 mm from the right-hand end).	
	c) Screw and tighten the drain plugs	12-21 mm box spanners
11	Put the tank in position, insert the flexible pipe between the filling pipe and the tank on the tank filler neck.	
12	Glue the tank protection packings in place under the fixing straps (Bostick). Place the fixing straps in position, insert the rear rubber packings and tighten the securing nuts of the strap tightening screws.	
13	Place the transverse packings of the tank in position and turn down the retaining clips on the packings.	
14	Place a Ligarex collar on the front part of the flexible pipe (see Pl. 30, fig. 3) between the filler pipe and tank (pliers 2483-T, see Pl. 17, fig. 2). Fit the side protection panel. Fit the wing	Pliers 2483-T 8 mm spanner and box spanner 14 mm box spanner
15	Connect the rear end of the flexible hose of the petrol pump feed pipe at about 370 mm from the rear end of the pipe. Insert the feed pipe in the petrol tank and couple the flexible hose to the tank filler neck.	
16	Couple the flexible vent hose to the tank. Fit a Ligarex clip (pliers 2483-T)	Pliers 2483-T
17	Fit the rear flexible hose of the petrol pump feed pipe, Tighten the fixing screws (spring washers under heads). Fit the sidemember lower closing panel. Tighten the fixing screws (plain washers under heads)	7 mm box spanner
18	Fit the petrol tank cover plate. Tighten the fixing screws (plain washers under heads). Glue the sill trimming on the petrol tank cover plate (Glutafix T, sold by Messrs. Beissier, 125, Rue de Reuilly, Paris 12^{e}). Fit the seat and the rear squab	12 mm box spanner
	IMPORTANT NOTE - In the event of leakage from the rubber connection hose to the tank, make sure that the joints between the rubber hose and the tank and between the rubber hose and the nylon hose are tight by using 2 Ligarex collars located as shown in Pl. 30, fig. 3 . Tighten the collars gently to avoid deformation of the nylon hose (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T

		TOOLS
	REPLACEMENT OF A FILLER PIPE.	
	Removal.	
19	Remove the rear wing and the side protection panel. Clean the working area carefully	8-14 mm box spanners
20	Remove the rear collar of flexible hose between the filler tube and the petrol tank. Remove the rear collar of the flexible hose between the filler pipe and the air pipe of the tank.	
21	Remove the fixing collar of the filler pipe from the wheel arch panel	8 mm box spanner
22	Remove the collar joint between the filler pipe and the wheel arch connection panel.	
	NOTE - It is unnecessary to remove the filler cap from the pipe.	
23	Disconnect the flexible hose between the air pipe and the filler pipe from the pipe. Disconnect the flexible hose between the filler pipe and the tank from the pipe. Remove the piping from the front.	
	Refitting.	
24	Place the filler pipe in position and engage in the flexible connection hose of the tank. Connect the flexible hose of the air pipe to the filler pipe neck. Place the collar joint in position between the filler pipe and the wheel arch connection plate.	
25	Fit the fixing collar of the filler pipe on the wheel arch. Tighten the fixing nuts (spring and plain washers)	8 mm box spanner
26	Fit a Ligarex clip on the flexible hose between the filler pipe and the tank and on the flexible hose between the filler pipe and the tank air pipe (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
27	Fit the side protection panel (plain and spring washers under the fixing nuts). Fit the wing	8-14 mm box spanners
	REPLACEMENT OF AN AIR PIPE AND AN AIR VENT PIPE	
	Removal.	
28	Lift and remove the rear squab. Remove the rear seat.	
29	Remove the petrol tank cover plate. Disconnect the flexible tank connection hose from the air pipe	12 mm box spanner

		TOOLS
30	Remove the right-hand rear wing and the side protection panel. Clean the working area thoroughly	8-14 mm box spanners
31	Remove the tank air pipe and air vent pipe fixing collars on the wheel arch. Turn back the straps retaining the air vent pipe on the wheel arch. Remove the pipe and the rubber rings protecting the pipe	8 mm box spanner
32	Remove the fixing screws of the rear vent pipe cup and remove the rear cup and gasket. Remove the gasket from the front cup.	
33	Disconnect the flexible hose between the air pipe and the filler pipe of the tank from the air pipe. Remove the air pipe and air vent pipe assembly from the rear of the car.	
	Refitting.	
34	Engage the front end of the air pipe in the hole in the right-hand sidemember closing panel. Make sure that the rubber guide rings are in position. Connect the air pipe to the flexible hose to tank. Fit a Ligarex clip (pliers 2483-T, see Pl. 17, fig. 2)......	Pliers 2483-T
35	Connect the rear end of the air pipe to the flexible connection hose of the filler pipe of the tank. Fit a Ligarex clip (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
36	Fit the air pipe fixing collars on the wheel arch panel. Tighten the nuts (plain and spring washers)	8 mm box spanner
37	Place the rear cups of the air vent pipe in position and insert the rubber gaskets. Tighten the nut moderately on the fixing screw (plain washer)	8 mm box spanner
38	Fit the tank fixing collar, tighten the nut (plain and spring washers). Fit the rubber protectors for the air vent pipe, turn down the retaining straps	8 mm box spanner
39	Fit the side protection panel, insert the rubber protectors for the air vent pipe. Tighten the fixing screws and nuts of the panel (plain and spring washers). Fit the wing	8-14 mm box spanners
40	Fit the petrol tank cover plate. Tighten the fixing screws (plain washers under heads). Glue the sill trimming (Glutafix T glue, sold by Messrs. Beissier, 125, Rue de Reuilly, Paris 12^{e}).	12 mm box spanner
41	Replace the rear seat and squab.	

TOOLS

REPLACEMENT OF A PETROL GAUGE TANK UNIT

Removal.

42 Lift the rear squab and remove. Remove the rear seat.

43 Remove the petrol tank cover plate .... 12 mm box spanner

44 Remove the negative cable from the battery. Disconnect the leads from the tank unit terminals.

45 Remove the tank unit fixing screws. Remove the tank unit complete with float. Remove the rubber gasket between tank unit and petrol tank.

Refitting.

46 Place the rubber gasket of the tank unit on the petrol tank.

Introduce the tank unit float into the tank and place the tank unit in position. Tighten the fixing screws (fibre washers under heads).

47 Connect the leads to the tank unit terminals. Close the electric circuit (ignition on) and make sure that the petrol gauge is functioning.

48 Fit the petrol tank cover plate. Tighten the fixing screws (plain washer under head).

Glue the sill trimming on the cover (Glutafix T glue, sold by Messrs. Beissier, 125, Rue de Reuilly, Paris 12^{e}).... 12 mm box spanner

49 Replace the rear seat and squab.

REPLACEMENT OF AN EXHAUST MANIFOLD.

		TOOLS
	Removal.	
1	Release the pressure in the suspension system. Undo the bleed screw of the control cylinder and set the manual height control lever in the "low" position	8 mm spanner
2	Remove the air filter and pipe assembly between filter and carburettor	12-17 mm box spanners
3	Remove the suspension sphere from the front right-hand suspension cylinder (strap wrench 2223-T, see Pl. 87, fig. 1). Close the openings of the suspension sphere and of the suspension cylinders (see Pl. 89)	Strap wrench 2223-T
4	Remove the exhaust manifold screen fixing screws. Remove the screen	12 mm spanner and box spanner
5	Remove the flange coupling the exhaust downpipe to the manifold	12 mm box spanner
6	Undo the manifold fixing nuts. Remove the retaining clips of the manifold screen	12 mm box spanner
7	Remove the exhaust manifold. Remove the gaskets.	
	Refitting.	
8	Place the manifold in position and insert the copper and asbestos gaskets.	
9	Fit the manifold screen retaining clips. The longest upper clip is fitted at the front. Tighten the fixing nuts of the manifold and of the screen retaining clips (spring washers under heads)	12 mm box spanner
10	Undo the fixing nuts of the collar securing the exhaust pipe to its support	12 mm box spanner
11	Place in position the flange coupling the exhaust pipe to the manifold. Tighten the nuts (spring washers under heads). Tighten the fixing nuts of the exhaust pipe retaining collar.	
12	Place the manifold screen in position. Tighten the fixing nuts and bolts (plain washers)	12 mm box spanner
13	Fit the suspension sphere on the front right-hand suspension cylinder.	

		TOOLS
14	Fit the air filter and pipe assembly between the filter and carburettor (spring washers under the fixing nuts of the air filter)	12-17 mm box spanners
15	Start up the engine. Tighten the pressure control valve bleed screw. Put the suspension system under pressure. Check the joint between the suspension sphere and suspension cylinder for leakage.	8 mm spanner

REPLACEMENT OF AN EXPANSION CHAMBER

Removal.

16	Remove the nuts of the collar securing the pipe to its support and withdraw the collar	12 mm box spanner
17	Remove the nuts of the fixing screws of the half-collar assemblies securing the pipe to the silencer and to the manifold.	
	Remove the front pipe or the expansion chamber	12 mm box spanner

Refitting.

18	Place the expansion chamber or the front tube in position. Place in position the half-collar assemblies securing the pipe to the silencer and to the manifold with the head of the fixing screws on the right-hand countersunk side.	
	Screw on nuts without tightening them (spring washers).	
19	Fit the collar securing pipe to its support. Screw on the nuts without tightening them (plain washers).	
20	Tighten the nuts of the half-collar assembly and the nuts of the collar securing the pipe to the support	12 mm box spanner

		TOOLS
	REPLACEMENT OF A SILENCER	
	Removal.	
1	Jack up the front of the vehicle (jacking bracket 2505-T, see Pl. 111). Remove the spare wheel and the air deflection panel	Jacking bracket 2505-T 12 mm box spanner
2	Remove the half-collars securing the silencer to the expansion chamber or to the front pipe	12 mm box spanner
3	Remove the fixing screws of the plates securing the rubber bands retaining the silencer outlet pipes	12 mm box spanner
4	Remove the fixing screws of the flange securing the silencer outlet pipes to the exhaust outlet pipes	12 mm box spanner
5	Remove the screws securing the spring on the silencer support bracket. Remove the plates and the rubber packings.	14 mm box spanner
6	Disengage the silencer and pipe assembly from the exhaust outlet pipes under the body. Withdraw the silencer from underneath the vehicle. Remove the gaskets from the pipes.	
7	Stripping the silencer : undo the nuts of the fixing screws of the half-collars of the silencer outlet pipes, remove the rubber stops, the screws, the rubber bands and the half-collars	12 mm box spanner
	Refitting.	
8	Assembling the silencer : Fit the fixing half-collars of the silencer outlet pipes and the rubber bands. Make sure that the distance pieces are in position in the rubber bands, insert the screws and screw on the nuts without tightening them (spring washers). Fit the gaskets on the ends of the silencer outlet pipes.	
9	Place the silencer in position and engage the rear end of the silencer outlet pipes in the front ends of the pipes under the body. Insert the flange fixing screws and tighten the nuts (spring washers)	12 mm box spanner
10	Insert the screws securing the spring to the silencer and insert the plates and rubber blocks. Insert the screws without locking them	14 mm box spanner
11	Fit the half-collars securing the silencer to the front pipe, placing the screw heads on the straight milled side. Tighten the fixing nuts (spring washers)	12 mm box spanners

		TOOLS
12	Place the fixing half-collars on the silencer outlet pipes. Tighten the fixing screws securing the rubber bands to the body and insert plates (spring washers). Fit the pipe rubber protectors and tighten the fixing screws of the half-collars of the silencer outlet pipes	12 mm box spanner
13	Tighten the fixing screw nuts of the flanges securing the silencer outlet pipes to the exhaust outlet pipes under the body. Tighten the screw securing the spring to the silencer	12-14 mm box spanners
14	Lower the car to the ground (jacking bracket 2505-T, see Pl. 111). Fit the air deflection panel and tighten the fixing screws (plain and spring washers). Refit the spare wheel	Jacking bracket 2505-T 12 mm box spanner
	REPLACEMENT OF THE EXHAUST OUTLET PIPES	
	Removal.	
15	Jack up the front of the car (jacking bracket 2505-T, see Pl. 111) or place on a lift	Jacking bracket 2505-T
16	Remove the rubber band fixing screws under the body and remove the plates. During this operation support the rear end of the exhaust pipes	12 mm box spanner
17	Remove the fixing screws of the flanges securing the exhaust outlet pipes to the silencer outlet pipes. Withdraw the exhaust outlet pipes	12 mm box spanner
18	Stripping the pipes : remove the rubber blocks, undo the rubber band fixing screws and remove the bands from the pipe fixing half-collars; remove the half-collars, the rear collars and the front coupling flange	12 mm box spanner
	Refitting.	
19	To assemble the pipes :	
	a) Fit the front flange coupling the exhaust outlet pipes to the silencer outlet pipes.	
	b) Make sure that the distance plates are in position in the rubber bands; screw on the nuts on the half-collar fixing screws without tightening them (spring washer). Fit the rubber stops.	
	c) Fit the rear fixing collars, insert the rubber bands and screw the nuts on to the fixing screws without tightening them (spring washers)	12 mm box spanner

		TOOLS
20	Fit the gaskets on the rear ends of the silencer outlet pipes. Engage the exhaust outlet pipes on the silencer outlet pipes.	
	Support the rear of the pipes and tighten the fixing screws of the flanges of the exhaust outlet pipes and silencer outlet pipes	12 mm box spanner
21	Put the fixing collars of the exhaust outlet pipes in place and tighten the nuts of the fixing screws of the half-collars and of the rear collars. Fit and tighten the screws securing the rubber band to the frame; make sure that the distance pieces are fitted; insert the plates (spring washer under the heads of the screws).	
22	Lower the car to the ground.	

TOOLS

ADJUSTMENT OF IGNITION ADVANCE

1 Turn the engine slowly by means of a starting handle in order to bring the first cylinder to the end of the compression stroke. Insert a 6 mm dia. rod in the hole provided in the clutch housing.

Turn the engine slowly until the rod falls into the recess in the flywheel. The engine is then at the firing point (10° on flywheel) .... 6 mm dia. rod

2 Undo the screw of the distributor control lever. Switch on the ignition.

Connect the lead of a test lamp to the condenser connection terminal, the bracket of this lamp being fixed to earth.

Separate the contact points by rotating the body of the distributor anti-clockwise. The lamp will light at the moment the contacts separate.

3 To adjust the variable advance control:

Place the advance lever on the facia panel 2 notches before the fully retarded position.

Without changing the position of the distributor, place the control lever so that the stop cut into the casing retaining plate is in the centre of the control lever groove (retard position) and tighten the set screw of the distributor control lever. Connect the distributor return spring and make sure that the distributor returns to the fully retarded position.

Fix the control cable to the control lever without changing the position of the latter.

4 *Withdraw the rod from the flywheel.*

5 Remove the test lamp. Switch off the ignition.

BENCH TEST OF A DISTRIBUTOR

6 Place the distributor on the test bench; connect the negative terminal of the test bench coil to the primary terminal of the distributor.

7 Check the insulation of the secondary circuit. Adjust the distance of the bench spark gap to 15 mm. Connect the secondary of the coil to the central contact stud of the distributor and connect the sparking plug leads to the spark gaps.

Rotate the distributor at a speed of 1000 r.p.m. for 15 minutes.

8 Check the grouping of the sparks: the angular distance must not exceed a maximum of 1.5° for all speeds (maximum speed of distributor = 2000 r.p.m.)

9 To check the adjustment of the automatic advance curve. The typical curve is as follows:

0° at 100 r.p.m. (distributor)
1.25 to 3° at 500 r.p.m.
5.5 to 7° at 1,000 r.p.m.
9.5 to 11.25° at 1,500 r.p.m.
13.5 to 15.50° at 2,000 r.p.m.

It may be necessary to vary the tension of the springs of the advance weights; adjust this tension by bending the spring attachment clip.

10 To check the insulation of the primary circuit.

Bring the distributor from which the condenser has been removed to a temperature of 60° C. After the platinum-plated screws have been undone, apply an A.C. current of 110 v, 50 cycles, between the positive terminal and the earth, inserting a lamp in series in the circuit. Apply this voltage for 1 minute, if the lamp lights insulation is faulty.

11 To check the operation of the vacuum diaphragm:

The latter must lift with a vacuum of 110 mm mercury and must have its maximum amplitude at 12° distributor. under a vacuum of 400 mm mercury.

The typical curve is as follows:

Advance: 0° for a vacuum of 100 mm
3 to 5.75° for a vacuum of 200 mm
8.25 to 10.5° for a vacuum of 300 mm
10 to 12° for a vacuum of 400 mm
10 to 12° for a vacuum of 500 mm

IMPORTANT NOTE - The operation of the diaphragm has a great effect on petrol consumption and on engine performance. *It must therefore not be eliminated under any circumstances.*

OPERATION No. ID 211-1 : *Replacement of a distributor*

TOOLS

REMOVAL

1 Disconnect the leads from the sparking plugs and coil. Disconnect the earth lead from the distributor.

Disconnect the vacuum pipe from the carburettor.

2 Undo the fixing screws of the distributor control lever. Remove the distributor .... 7 mm box spanner

REFITTING

3 Turn the engine to bring the first piston to the end of the compression stroke.

Introduce a 6 mm dia. rod in the hole provided in the crankcase (left hand side), the latter is partially masked by by the dynamo.

Turn the engine slowly in its own direction of rotation until the rod engages in the recess in the flywheel. The engine is then at the firing point at 10° advance .... 6 mm dia. rod

4 Remove the cover of the distributor, lower the distributor into the housing, turning the rotor to make sure that the distributor shaft dog engages correctly in that of the driving shaft

Connect the leads to the coil. Connect the earth lead to the condenser fixing screw.

5 Adjust the advance control (see Op.ID 211-0, paragraphs 3 to 5).

6 Connect the leads to the sparking plugs. Connect the vacuum pipe to the distributor and to the carburettor.

RECONDITIONING AN S.E.V. DISTRIBUTOR

		TOOLS
	Dismantling (see Pl. 32).	
1	Remove the distributor cover and the rotor. Disconnect the primary contact strip (1). Remove the condenser (2) and terminal (3). Disconnect the earth lead from the distributor body	7 mm box spanner
2	Remove the distributor cover retaining springs.	
3	Remove the retaining spring (4) of the locking pin (5) of the dog (6). Drive out the pin (5). Remove the dog (6) and the clearance adjustment washers (7).	
4	Remove the diaphragm (8), diaphragm control rod (9) and the pilot rod (10).	
5	Gently tap the lower end of the spindle to release the contact support plate assembly (12). Rotate the spindle in order to release the contact support plate (12).	
6	Remove the contact support plate thrust ring (14) from the distributor body. Remove the clearance adjustment washers. Unhook the springs (15), remove the rollers (17), remove the cam (18) and remove the friction washer.	
7	Remove the flat ring (19). Remove spade terminal (20), terminal (21), contact (22), contact support (23) and the insulating washer (24)	7 mm spanner
8	Remove the leads from the distributor cover.	
9	Clean the pieces.	
	Assembling (see Pl. 32)	
10	Check the condenser. Use a condensoscope to check the series resistance, the capacity and the insulation of the condenser. With this apparatus a more accurate check can be carried out than by testing with lamp in series at 110 v.	
	NOTE - If the surfaces of the contact points are pitted or worn, the contacts must be renewed.	
11	Place the thrust ring (14) of the contact support plate (12) in the body of the distributor.	
12	Place the screw (25) on the support (23). On screw (25) fit the terminal of the primary wire, a plain washer an nut, without tightening the latter. On plate (12) place the contact support (23). On the screw (25) fit the terminal of the primary wire, a plain was. and a nut, without tightening.	

TOOLS

Place on the contact support (23), the insulating washer (24), the contact (22), fitting the contact spring between the support (23) and the terminal of the primary wire. Tighten the nut.
Attach terminal (20) to the contact support (23) and tighten screw (25) (spring washer under the head).
Place the flat ring (19) on the plate.

13 Oil the spindle and place it in the body of the distributor, using two adjusting washers.

14 Fit the dog (6). Make sure that the hole for pin (5) in the shaft is off-set. Between the dog and the distributor insert an adjusting washer (7). Place the pin (5) in position temporarily. Make sure that the spindle turns freely and that the longitudinal play does not exceed 0.4 mm. If it does then use another adjusting washer

Drive in the pin (5) and place the pin retaining spring (4) in position. Make sure that the direction of the winding of the spring (4) is left hand (see fig. 2). If not, turn the spring round to reverse the direction of winding.

15 Place the friction washer on spindle. Place the cam (18) in position; with the small side of the dog towards the operator, the groove in the cam will be on the right.
Fit the rollers (17), the smaller end upwards. Fit the springs (15) of the advance weights (16).

16 Place the contact support plate assembly (12) in the distributor body on the ring (14). (Oil the balls first with vaseline oil). Connect the earth lead by means of screw (26).

17 Fit the pilot rod (10), the diaphragm control rod (9) and the retainer ring on the support plate driving peg.

18 Fit the primary terminal (3), the primary contact strip (1), the primary wire to the coil and the condenser (2).

19 Connect the vacuum diaphragm (8) to the control rod (9) and tighten the diaphragm fixing screws (spring washers under heads).

20 Fit the distributor cover retaining springs (27), adjust the nuts (28) to make contact with the flat ring (19). Make sure that the contact support plate assembly (12) can rotate.

21 Adjust the distance between the contact points to 0.4 mm by turning the eccentric screw (29). Tighten the locking screw.

22 Connect the wires on the cover of the distributor.

23 Place the rotor on the cam, make sure that the lug is correctly engaged in the groove in the cam.

Refit the cover of the distributor.

24 Bench test the distributor (see Op. ID 211-0).

TOOLS

RECONDITIONING A DUCELLIER DISTRIBUTOR

Dismantling (see Pl. 33)

25 Remove the distributor cover. Remove the rotor.

26 Disconnect the wire (1) from the primary terminal (2). Remove the screw (3) fixing the condenser and the contact support (6) and remove the condenser.

27 Remove the screw (4) fixing the spring (5) and the contact support (6). Remove the spring (5). Raise the sector (7) retaining the diaphragm control rod (8), disengage the suction unit (9) and disengage the sector (7) from the rod (10).

28 Remove the screw (11) fixing the spring (12) and the contact support (6). Remove the spring (12) and the earth lead from the distributor.

29 Remove the primary terminal (2) from the body of the distributor. Disengage the contact support (6).

30 To dismantle the contact support plate:

a) Remove the connecting clip (13), remove the fibre washer (14) and the movable contact (15) together with the primary wire (16).

b) Remove the rod (10) and remove the lower thrust washer.

c) Remove the screw (17) fixing the contact plate (18). Remove the plate (18).

31 Remove the circlip (19) and the washer (20). Disengage the cam (21) with its plate (22) and remove the lower adjusting washer.

32 Remove the spring (23) and the pin (24) locking the spindle (25). Remove the dog (26) and the celeron washer (27).

33 Remove the spindle (25), the spacing washer (28) and the celeron washer (29) from the body of the distributor.

34 To dismantle the spindle (25):
Remove the circlips (30) and disengage the balance weights (31), the distance washers (32) and the springs (33) from the plate (34).

Assembly (see Pl. 33)

35 To assemble the spindle (25):
Put the distance washers (32) and the balance weights (31) in position.
Hook on the springs (33) and fit the circlips (30).

		TOOLS
36	Place on the spindle (25) the celeron washers (29) and engage this assembly in the body of the distributor. Fit on the spindle (25) a celeron washer (27) and fit the dog (26). Provisionally fit the pin (24). Make sure that the spindle (25) turns freely and that the longitudinal clearance does not exceed 0.4 mm, if so fit a spacing washer (28) between the shoulder "a" of the spindle (25) and the celeron washer (29). Fit the assembly again, oil the spindle (25) (vaseline oil) and fit the pin (24) and the spring (23).	
37	Fit the cam (21), inserting a distance washer. The slot in the cam (21) should be opposite the narrow side of the drive dog (26). Fit the washer (20) and the circlip (19).	
38	To assemble the contact support (6): a) Fit the contact plate (18) and tighten the screw (17) (plain washer under the head). b) Fit the rod (10), inserting a thrust washer. c) Fit the movable contact (15) by engaging the spring (35) between the body of the contact (15) and the insulated stop (36).	
39	Place the contact support assembly (6) in the body of the distributor. Fit the spring (12) and tighten the screw (11) fixing the spring and the contact support (6) (insert the terminal of the earth lead and a spring washer).	
40	Offer up the suction unit (9), fit the sector (7) on the rod (8) and put this assembly in position.	
41	Fit the spring (5) and tighten the screw (4) fixing the spring (5) to the suction unit (9) and the contact support (6) (spring washer under head).	
42	Fit the condenser, placing a spring washer between the flange (37) fixing the suction unit (9) and the flange (38) fixing the condenser. Tighten the screw (3) (spring washer under the head).	
43	Engage the terminal of the primary wire (16) between the head of the terminal (2) and the insulating sleeve (39). Put this assembly in position in the distributor and fit on the terminal (2) the insulating washer (40), a plain washer, the eyelet of the wire (1), a plain washer and the nut (41) tightening the terminal (2)	10 mm box spanner
44	Adjust the contact gaps to 0.4 ± 0.05 mm. Loosen the screw (17) and move the contact plate (18) in the direction required. Tighten the screw (17).	
45	Fit the rotor on the cam, make sure that the dowel is engaged in the slot in the cam.	
46	Bench test the distributor (see Op.ID.211-0).	

		TOOLS
	REMOVAL	
1	Undo the screws securing the cable to the distributor plate. Undo the screws securing the sheath on the fixing plate of the housing	8 mm spanner
2	Remove the central plate from the facia.	
3	Remove the control handle from the facia. Remove the control	17 mm spanner
	REFITTING	
4	Engage the cable and sheath assembly in the rubber grommet on the scuttle panel.	
5	Place the control handle complete with washer in position (washer shoulder towards the front). Connect the handle to the control (serrated washer between the control and the facia panel). Tighten the hollow fixing screw of the control. Make sure that the handle is vertical when in the fully retarded and fully advanced positions	17 mm spanner
6	Fit the central plate on the facia. Tighten the fixing screws (cup washers under heads). Place the rubber stop of the glove compartment cover under the upper fixing screw.	
7	Connect the advance control to the distributor. Adjust the control (see Op. ID 211-0, paragraph 6 and following).	

PARTICULAR POINTS.

Checking the oil pressure (on the vehicle)

1 *Start the engine and leave running in order to bring the oil temperature to 60 C.*

2 *Remove the screw from the oil feed pipe to the cylinder head. Connect in its place a pressure gauge which reads from 0 to 150 p.s.i. (0 to 10Kg cm² (union screw MR.3705, see Pl.16, fig.5).*

3 *The pressure should read between 54 and 58·5 p.s.i. (3·8 to 4·1K g/cm²) with the engine running at 4000 r.p.m.*

		TOOLS
	CHECKING THE OIL PRESSURE (on vehicle)	
1	Start the engine and let it run in order to bring the oil to a temperature of about 60° C. Switch off the engine.	
2	Remove the cylinder head lubrication screw. Connect the pressure gauge feed pipe using union MR 3705 (see Pl.16, fig.5) Use a pressure gauge graduated from 0 to 150 p.s.i. (0 to 10 kg/cm²)	12-17 mm box spanners Union MR 3705
3	Start the engine and let it run at 4,000 r.p.m.; read the pressure - this should be between 54 and 58.5 p.s.i. (3.8 and 4.1 kg/cm²).	
	NOTE - If the pressure is not correct the oil pump must be removed. For this operation the engine will have to be removed first.	
4	Switch off the engine. Disconnect the pressure gauge. Replace the cylinder head lubrication screw. Insert a double copper joint	12-17 mm box spanners

PARTICULAR POINTS

Replacement of an oil pump.

To remove

Remove the engine-gearbox assembly and leave suspended from a pulley block for this operation.

To fit

10-11 *Rotate the cranshaft to the T.D.C. of the first cylinder, end of compression and engage the oil pump (the drive dog for the distributor is parallel with the centre line of the engine, the small side towards the engine after fitting in position).*

Fixing screws: tightening torsion = 11 ft.lbs (1·5 m.kg) max., locknuts: tightening torsion = 22 ft.lbs (3 m.kg).

Pipe unions: tightening torsion = 43 ft.lbs (6 m.kg), locknuts: tightening torsion = 29 ft.lbs (4 m.kg).

REPLACEMENT OF AN OIL PUMP

		TOOLS
	To remove:	
1	Remove the engine gearbox assembly (see Op.ID 100-1, paragraphs 1 to 25). Leave the engine-gearbox assembly suspended from the pulley block. Drain the oil from the engine	21 mm box spanner
2	Remove the sump, avoid damaging the gaskets	12 mm box spanner
3	Remove the distributor	
4	Unscrew the pipe union from the oil pump. Unscrew the pipe union on the cylinder block and rotate the pipe in order to release it	14-26 mm spanners
5	Release the locknut and undo the oil pump fixing screw. Remove the pump	16 mm box spanner 17 mm spanner
	To Refit:	
6	a) Rotate the crankshaft to the T.D.C. of first cylinder (end of compression). b) Engage the oil pump so that the driving dog for the distributor is parallel with the centre line of the engine, the small side turned towards the engine after the pump has been placed in position. c) Lightly tighten the pointed screw fixing the pump so as not to deform the tube maximum 11 ft.lbs (1.5 m.kg). Lock the lock nut (3 m.kg)	 16 mm box spanner 17 mm spanner
7	Place the piping in position after making sure that the tapered union is in the cylinder block. Tighten the pipe union nuts to 43 ft.lbs (6 m.kg) and the locknuts to 29 ft.lbs (4 m.kg)	14-26 mm spanners

		TOOLS
8	Fitting the sump:	
	a) Replace the cork joints of the front and rear bearing caps. At front - place a cork gasket, the ends of which must be smeared with "Hermetic". At rear - place a cork gasket, the ends of which must be smeared with "Hermetic", and the cap groove front sealing plate.	
	b) If the gaskets between the sump and the cylinder block need replacing, cut such replacement gaskets so that they are flush with the bearing caps, using a sharp knife. Carefully clean the mating faces of the cylinder block and the sump. Cut the replacement gaskets to make them flush with the bearings. Smear the ends of the gaskets generously with "Hermetic" and put them in position.	
	c) Put the sump in position and tighten the fixing bolts. The long screws are for the front and rear bearings	12 mm box spanner
9	Fit the distributor (see Op.ID 211-1, paragraphs 3 to 6).	
10	Fit the engine-gearbox assembly on the car (see Op.ID 100-1, paragraphs 28 to 57). Fill the engine with oil - 7 pints (4 litres) of SAE 20 oil.	

TOOLS

NOTE - For this operation the water pump and dynamo driving belt must be removed (see Op.ID 231-4).

1 Use fixture 1683-T (see Pl.58).

Place the gauge pin bracket (B) in position with the face marked 2 *pulleys* towards the front and fix the bracket on the boss provided for attachment of the high pressure pump on the DS 19 .... Fixture 1683-T

2 Place rod (A) in position with the ball end resting on the side faces of the groove of the pulley to be aligned (see fig.3), and with the rod resting on one of the gauge pins (C) in the area "f" or "g".

NOTE - When the rod engages at "g" use a set of feeler gauges to make sure that there is clearance between the gauge pin and the rod. This clearance must be 0.45 ± 0.25 mm in zone "f" if the pulley is properly aligned.

3 Adjustment of the water pump pulley

1st. case:

When the rod bears on "f". Reduce the thickness of the adjusting washers of the pulley by three times the amount of the clearance "d" measured at "g" plus 0.45 x 2 = 0.90 mm in order to obtain a clearance at "f" of 0.45 ± 0.25 mm. The pulley is then correctly adjusted.

Example 1 - Clearance "d" measured at "g" = 0.3 mm. The thickness of the adjusting washers of the pulley must be reduced by:
(0.3 x 3) + (0.45 x 2) = 0.90 + 0.90 = 1.80 mm

2nd. case:

When the rod bears on "g". If the clearance "d" measured at "f" is greater than 0.45 ± 0.25, the thickness of the pulley adjusting washers must be increased by twice the difference between the clearance measured and 0.45 mm.

Example 2 - Clearance "d" measured at "f" = 0.80 mm. The thickness of the pulley adjusting washers must be increased by:
(0.80 - 0.45) x 2 = 0.70 mm.

3rd. case:

If the clearance "d" measured at "f" is less than 0.45 ± 0.25 mm, the thickness of the pulley adjusting washers must be decreased by twice the difference between 0.45 mm and the measured distance.

Example 3 - Clearance "d" measured at "f" = 0.25 mm. The thickness of the pulley adjusting washers must be decreased by:
(0.45 - 0.25) x 2 = 0.20 x 2 = 0.40 mm.

4 Adjustment of the dynamo pulley (*cars delivered since May 1959*).

NOTE - When the rod bears on "i", the clearance "d" must be 0.225 ± 0.05 mm in the region "h" if the pulley is aligned correctly.

1st. case:

When the rod bears on "h". Reduce the thickness of the pulley adjusting washers by five times the clearance "d" measured at "i", plus 0.225 x 4 = 0.90 mm, to obtain at "h" a clearance of 0.225 ± 0.05 mm. The pulley is then correctly adjusted.

TOOLS

Example 1 - The clearance "d" measured at "i" = 0.3 mm. The thickness of the adjusting washers will have to be reduced by:
(0.15 x 5) + (0.225 x 4) = 0.75 + 0.90 = 1.65 mm.

2nd. case:

When the rod bears on "i". If the clearance "d" measured at "h" exceeds 0.225 ± 0.05 mm, the thickness of the adjusting washers of the pulley will have to be increased by 4 times the difference between the measured clearance and 0.225 mm.

Example 2 - Clearance "d" measured at "h" = 0.40 mm. The thickness of the pulley adjusting washers will have to be increased by: (0.40 - 0.225) x 4 = 0.70 mm.

3rd. case:

If the clearance "d" measured at "h" is less than : 0.225 ± 0.05 mm, the thickness of the adjusting washers will have to be reduced by 4 times the difference between 0.225 mm and the clearance measured.

Example 3 - Clearance "d" measured at "h" = 0.02 mm. The thickness of the pulley adjusting washers will have to be reduced by:
(0.225 - 0.020) x 4 = 1 mm.

5 Remove the pulley. Remove the adjusting washer or washers, measure the thickness and select a washer of suitable thickness from among those sold by our Spare Parts Department.

6 Fit the adjusting washer or washers in accordance with the above calculations and fit the pulley. Check the alignment (see paragraph 2).

7 Remove the gauge pin bracket (B).

		TOOLS
	REMOVAL (see Pl. 1)	
	Drain the radiator and pipes. Save the water which contains anti-freeze.	
	Disconnect the radiator tie-bar from the radiator and water pump. Remove the fan	8-12 mm box spanners
	Disconnect the dynamo adjusting rod from the water pump and disengage the belt from the dynamo	12 mm spanner and box spanner
	Disconnect the rubber pipes from the water pump.	
	Disconnect the water pump from the cover (48) and disengage the pump	12 mm spanner and box spanner
	Scrape the joint face.	
	ASSEMBLY (see Pl. 1)	
	Smear the joint faces of the cover (48) and the pump with "Hermetic". Stick the joint on the cover.	
	Offer up the pump. Tighten the nuts and fixing screws	12 mm spanner and box spanner
	Connect the rubber pipes to the pump. Tighten the clips (fit a rubber ring under the clip on the rubber connecting pipe to the inlet manifold)	
	Put the belt in position. Connect the dynamo adjusting rod (plain and spring washers under nuts)	12 mm box spanner
11	Fit the fan. Tighten the screw to 7.2 ft.lbs (1 m.kg). Fit the radiator tie-bar (plain and spring washers)	12 mm box spanner
12	Fill the radiator with the engine running.	

PARTICULAR POINTS.

Assembly

The bush for the water pump body is made of porous bronze, before assembling immerse the bush in engine oil for a few minutes. This bush must not be reamered, or pierced when the oiler is fitted (important).

6 *Make sure that the bearing face (on the pump body) of the packing gland is neither pitted nor scored.*

		TOOLS
	DISMANTLING (see Pl.35)	
1	Place the pump on a stand (stand MR 3676-180, see Pl.37, fig.1). Turn back the locking tabs and remove the pulley fixing nut (1). Remove the lock washer (2) and washer (3). Remove the pulley, the key (4) and the adjusting washer or washers (5).	Stand MR-3676-180 16 mm box spanner
2	Remove the nut (6) from the pump body (spanner 1646-T, see Pl.37, fig.2). Drive out the spindle and impellor by tapping on the end with a bronze headed mallet. Note the arrangement of the retaining rings (8). Remove cup (9) and the packing (10)	Spanner 1646-T
3	Remove the pump bearing (11). The bearing can be released by hand but use a drift if necessary	Drift 24 mm dia. x 30 mm long. Mandrel 14 mm dia. x 150 mm long.
4	Remove bushing (12) (extractor 2291-T, see Pl.37, fig.4)	Extractor 2291-T
5	Clean the parts.	
	ASSEMBLY (see Pl.35).	
	NOTE - The pump body bush is made of porous bronze: before assembling, immerse this bushing in an oil bath (engine oil) for several minutes until the bronze is thoroughly impregnated. Under no circumstances must this bronze bush be rebored as its permeability will then deteriorate; it must not be pierced when the greaser is positioned.	
6	Make sure that the bearing face "a" of the packing gland on the pump is neither pitted nor scored. Fit the bush (12), using a press, into the pump body (dolly and mandrel MR 3676-270, see Pl.37, fig.3)	Dolly and mandrel MR 3676-270
7	Place the packing (10), first moistening with castor oil, on the pump shaft (7). Fit this assembly on the pump body.	

		TOOLS
8	Place the retaining rings (8) in position (adhesive grease) and place the cup (9) on the pump shaft (7).	
9	Place the pump on a stand (stand MR 3676-180, see Pl.37, fig.1)	
	Place the bearing (11) in position in the pump body using a tube.	
	Fit the nut (6) locking the bearing (11) (spanner 1646-T, see Pl.37, fig.2).	
	Put in position the pulley adjusting washer (5), the key (4), the pulley, washer (3), the locking washer and the pulley retaining nut (1)	Tube dia. 16 x 26 mm x 100 mm long. Spanner 1646-T

REPLACEMENT OF A WATER PUMP AND DYNAMO BELT

		TOOLS
	Removal	
1	Disconnect the flexible air hose from the radiator tie bar.	
2	Unscrew the dynamo fixing screws. Disconnect the tie bar from the dynamo and tilt the dynamo towards the engine...	14 mm spanner or ring spanner 12 mm box spanner
3	Release the dynamo belt from the driving pulley and from fan.	
	Refitting	
4	Place the belt in position on the water pump pulley, pass it over the driving pulley on the left hand side and have an assistant turn the engine in order to facilitate the engagement of the belt. Place the belt in position on the dynamo pulley.	
5	Tighten the belt. Replace the dynamo tie-rod. Tighten the tie-rod fixing nut (plain and spring washers). Tighten the dynamo fixing screws	12 mm box spanner 14 mm spanner or ring spanner
6	Connect the flexible air hose to the radiator tie bar. Fit a Ligarex clip (pliers 2483-T, see Pl.17, fig.2)	Pliers 2483-T

REPLACEMENT OF A DYNAMO AND WATER PUMP DRIVING PULLEY

		TOOLS
	Removal (see Pl.49)	
7	Disconnect and remove the battery. Disconnect the flexible air hose from the radiator tie bar.	
8	Unscrew the dynamo fixing screws. Remove the dynamo tie bar fixing nut and withdraw the tie bar from the dynamo..	12 mm box spanner 14 mm ring spanner
9	Disengage the belt from behind the drive pulley.	
10	Remove the pulley fixing screw (84), the spring washer and the spacer washer (116). Disengage the pulley and withdraw from the left hand side of the car. Remove the key (85) and adjusting washer (117)	14 mm spanner
	Refitting (see Pl.49)	
11	Put in position the adjusting washer (117), the pulley and the washer (116). Tighten the fixing screw (84)	14 mm spanner
12	Align the pulley (see Op.ID 231-0).	

		TOOLS
13	Remove the screw (84), the washer (116) and the pulley. Fit the key (85). Fit the pulley and place the belt in position, fit washer (116) and tighten the fixing screw (84) (spring washer under head)	14 mm spanner
14	Put the belt in position on the pulleys. Tighten the belt to a moderate degree, tighten the dynamo fixing screws and tighten the nut securing the tie bar on the dynamo	12 mm box spanner 14 mm ring spanner
15	Connect the flexible air hose to the radiator tie bar. Fit a Ligarex clip (pliers 2483-T, see Pl.17, fig.2). Fit and connect the battery	Pliers 2483-T 12 mm box spanner
	REPLACEMENT OF A DRIVING SHAFT	
	Removal (see Pl.49)	
16	Remove the pulley from the driving shaft (see this operation paragraphs 7 to 10)	12 mm box spanner 14 mm ring spanner
17	Remove the nut (86) retaining the bearing (87), after first removing the locking pin (spanner 1640-T, see Pl.55, fig.5)	Spanner 1640-T
18	Remove the battery tray, the spare wheel and the left hand front wing	12-14 mm box spanners
19	Remove the steering assembly (see Op.ID 100-1, paragraph 9).	
20	Remove the driving shaft (118), the bearing (87) and the retaining ring (88) assembly (extractor MR-3404-20, see Pl.17, fig.3). Remove the bearing (87) and the retaining ring (88) from the shaft	Extractor MR-3404-20
	Refitting (see Pl.49)	
21	Fit the rubber washer (120) at a distance of "a" = 50 mm from the bearing (87), and place the thrust washer (88) and the bearing (87), after previously greasing, on the driving shaft.	
22	Fit the above mentioned assembly in the housing. Tighten the nut (86) retaining the bearing (87) and insert locking pin (spanner 1640-T, see Pl.55, fig.5)	Spanner 1640-T
23	Fit the washer (117). Place the key (85) in position and fit the pulley (place the belt in position) and washer (116) and tighten the pulley fixing screw (84) (spring washer under head)	14 mm spanner
24	Place the belt in position on the water pump and dynamo pulleys and tighten to a moderate degree. Tighten the dynamo fixing screws and the nut securing the tie bar on the dynamo	12 mm box spanner 14 mm ring spanner
25	Fit the steering assembly (see Op.ID 100-1, paragraph 42).	

		TOOLS
26	Connect the flexible air hose to the radiator tie bar. Fit a Ligarex clip (pliers 2483-T, see Pl.17, fig.2)	Pliers 2483-T
27	Fit the battery tray. Fit and connect the battery. Replace the left hand front wing and the spare wheel	12-14 mm box spanners
	REPLACEMENT OF A WATER PUMP PULLEY	
	Removal (see Pl.35)	
28	Remove the fan. Unscrew the dynamo fixing screws, remove the nut securing the tie rod to the dynamo and slide the dynamo towards the engine. Remove the belt from the dynamo pulley and from the water pump pulley	12 mm box spanner 14 mm ring spanner
29	Hold the water pump pulley in position and remove the fixing nut (1), the locking washer (2) and the washer (3). Withdraw the pulley, the key (4) and the adjusting washer (5). Withdraw the belt from the rear of the dynamo tie-rod	16 mm box spanner
	Refitting (see Pl.35).	
30	Fit the adjusting washer (5), the pulley and the washer (3) in position. Tighten the nut (1)	16 mm box spanner
31	Align the pulley (see Op.ID 231-0).	
32	Remove the nut (1), the washer (3) and the pulley. Fit the key (4) in position. Fit the pulley, the washer (3), the locking washer (2). Tighten the nut (1) to between 18 and 21.6 ft.lbs (2.5 - 3 m.kg). Turn down the tabs on the nut	16 mm box spanner
33	Place the belt in position on the water pump pulley and on the dynamo pulley. Tighten the belt moderately and tighten the screws securing the dynamo and the nut securing the tie-rod (plain and spring washers)	12 mm box spanner 14 mm ring spanner
34	Fit the fan. Tighten the fixing screws to 7.5 ft.lbs (1 m.kg).(This torsion must not be exceeded)	12 mm box spanner

PARTICULAR POINTS.

Checking a thermostat.

Commences to open at 72–76 °C, fully open at 90 C in less than 20 seconds. The thermostat cannot be repaired.

REPLACEMENT OF A RADIATOR

		TOOLS
	Removal	
1	Drain the radiator (remove the filler plug). Retain the water which contains anti-freeze mixture.	
2	Remove the spare wheel.	
3	Disconnect the upper flexible pipe hose from the radiator. Disconnect the lower flexible hose from the steel pipe.	
4	Disconnect the radiator tie bar from the radiator and water pump	12 mm box spanner
5	Remove the screws securing the radiator to the front crossmember. Remove the distance pieces between the exhaust pipe bracket and the radiator retaining strap. Remove the radiator	14 mm box spanner
	Refitting	
6	Make sure that the rubber blocks are correctly positioned in the support on the crossmember.	
7	Place the radiator in position. Connect the upper and lower flexible hose. Place the distance piece in position between the exhaust pipe bracket and the radiator retaining strap	
8	Insert the fixing screws (spring washers under the heads). Centre the radiator: the fan blades must not touch the cowl. Tighten the fixing screws	14 mm box spanner
9	Fit the radiator tie bar to the radiator and water pump (plain and spring washers under the head of the screw and under the nut)	12 mm box spanner
10	Tighten the flexible hose clips. Replace the spare wheel.	
11	Fill the radiator, with the engine running.	

TOOLS

REPLACEMENT OF A THERMOSTAT

Removal

12 Drain the radiator. Retain the water which contains anti-freeze mixture.

13 Remove the flexible water return hose.

14 Remove the clip holding the thermostat in the flexible pipe. Remove the thermostat and if necessary use a screwdriver to release the flexible hose.

Refitting

15 Insert the thermostat in position in the flexible hose until the flanged edge of the thermostat is in contact with the shoulder of the flexible hose. Tighten the thermostat fixing clip.

16 Fit the flexible hose and connect it to the cover of the water pump and to the radiator. Fit and tighten the fixing clips (pliers 2483-T, see Pl.17, fig.2) .... Pliers 2483-T

17 Fill the radiator, with the engine running.

CHECKING A THERMOSTAT

18 Immerse the thermostat in hot water. When the water reaches a temperature of between 72° and 76° C, the butterfly valve must start to open.

When the thermostat is shaken in water at a temperature of 90° C, the butterfly valve must open fully in less than 20 seconds.

NOTE - The thermostat cannot be repaired. If it does not satisfy the tests described above, it must be replaced.

PARTICULAR POINTS.

Replacement of a fan

Remove the fan on the right hand side of the fan cowling.

On assembly tighten the fan fixing screws to 7·5 ft.lbs (1 m.kg) (do not exceed this tightening torsion).

		TOOLS
	REPLACEMENT OF A FAN	
	Removal	
1	Unscrew and remove the fan fixing screws. Remove the fan on the right hand side of the fan cowling between the flexible return pipe and the exhaust down pipe	12 mm box spanner
	Refitting	
2	Place the fan in position inserting it between the exhaust down pipe and the flexible return pipe of the water pump. Fit the fan fixing screws and tighten them to 7.5 ft.lbs (1 m.kg) *This torsion must not be exceeded.*	12 mm box spanner
	REPLACEMENT OF A FAN COWLING	
	Removal	
3	Disconnect and remove the battery	12 mm box spanner
4	Disconnect the radiator tie bar from the water pump and from the radiator and withdraw it towards the heating and demisting radiator	8-12 mm box spanners
5	Remove the fan (see this operation, paragraph 1)	12 mm box spanner
6	Remove the fan cowling fixing screws and withdraw the fan cowling	12 mm box spanner
	Refitting	
7	Place the fan cowling in position. Insert the fixing screws without tightening them (plain and spring washers under the heads).	
8	Fit the fan (see this operation, paragraph 2)	12 mm box spanner
9	Make sure that the fan blades do not touch the fan cowling. Tighten the fan cowling fixing screws	12 mm box spanner
10	Place the radiator tie bar in position. Tighten the fixing screw and nut (plain and spring washers)	8-12 mm box spanners
11	Fit the battery and connect the leads.	

TOOLS

REMOVAL

1 Remove the gearbox (see Op.ID 330-1, paragraphs 1 to 17)

2 Disconnect the clutch from the engine flywheel and remove .... 12 mm box spanner

REFITTING

3 To connect the clutch to the engine flywheel:

a) Make sure that the disc bearing faces on the clutch and on the flywheel are clean.

b) Connect the clutch to the flywheel. Use a mandrel (mandrel 1712-T, see Pl.40, fig.4) or a clutch shaft in order to centre the disc.

When tightening the fixing screws make sure that the mandrel slides easily, thus indicating that the disc has been properly centred. Tighten the screws to $14.5 {}^{+1.9}_{\ 0}$ ft.lbs ($2 {}^{+0.25}_{\ 0}$ m.kg) (spring washers under heads).

Withdraw the mandrel .... Mandrel 1712-T
12 mm box spanner

4 Replace the gearbox (see Op.ID 330-1, paragraphs 18 to 39).

PARTICULAR POINTS

Dismantling.

1 *Mark the position of the clutch driving plate on the toggle carrier plate.*

Assembly.

5 *Reface the clutch driving plate by grinding, if this is not possible a facing tool may be used. Minimum thickness after rectification 12 mm; replace the driving plate if the thickness is less than 12 mm.*

On assembly, compensate for this loss of thickness by fitting steel washers to the springs, equal in thickness to the amount removed from the clutch driving plate. (original thickness = $13^{\;0}_{-0{\cdot}3}$ *mm*

6 *Spring characteristics:*

6 springs marked white, length 29·7 mm, under load of $52\,^{+3{\cdot}5}_{\;\;0}$ *kg.*

3 springs marked green, length 29·7 mm, under a load of $64\,^{+4{\cdot}5}_{\;\;0}$ *kg.*

When assembling, fit one spring with green markings between two springs with white markings and each group of three springs between two toggles.

9 *The clutch can only be adjusted when in the operating position. Use the fixture (1701–T, see Pl.39 or MR.3457-100, see Pl 40 ; dimension "a" 37 mm between the toggle and the driving plate and "b" 17·8 mm between the driving plate and the toggle carrier plate see Pl 39, fig. 2*

TOOLS

DISMANTLING (see Pl.38)

1 Using a centre punch, mark the position of the clutch driving plate on the toggle carrier plate (2). With a saw blade remove the metal of the nuts (3) from the slots of the screws (4).

Remove the toggles (5) by unscrewing the adjusting nuts (3) .... 14 mm spanner

2 Withdraw the clutch driving plate (1), the springs (6) and the spring cups (7).

3 Remove the toggles (5) and the toggle springs (8).

4 Clean the parts.

ASSEMBLY (see Pl.38)

5 Reface the clutch driving plate (1) on a lathe (it is preferable to carry out this operation with a grinding wheel, but in an emergency a facing tool can be used).

NOTE - Each time the surface of the clutch driving plate is refaced, there is a resultant decrease in the pressure exerted on the clutch disc. This reduction in pressure must be compensated by fitting washers cut from sheet metal equal in thickness to the amount of metal removed during refacing.

TOOLS

The thickness needed for these washers can be found by measuring the distance "c" (see fig.3). This was originally $13^{\ 0}_{-0.3}$ mm.

If the distance "c" is less than 12 mm, the plate cannot be refaced any more but must be renewed.

6 To test the springs (use fixture 2420-T, see Pl.6):

6 springs, white markings: length = 29.7 with a load of $52^{+3.5}_{0}$ kg.

3 springs, green markings: length = 29.7 with a load of $64^{+4.5}_{0}$ kg. .... Fixture 2420-T

NOTE - If the calibration test fixture is not available, the springs must be renewed each time the clutch is overhauled.

7 Hook the springs (8) on to the toggle carrier plate (2).

Put the clutch springs (6) on the bosses of the clutch driving plate (1), with one spring with green markings between two springs with white markings, each group of three springs being fitted between two toggles. Place a cup (7) on each spring and if necessary insert washers cut out in accordance with paragraph 5 between the cup and spring.

Place the toggle carrier plate (2) on the cups in accordance with the reference marks made when dismantling, and place the toggles (5) under the springs (8).
Insert the screws (4).

Place the clutch assembly on a bench (use fixture 1701-T, see Pl.39). Compress the assembly and fit the washers (9) on the toggle screws. Tighten the nuts (3) to bring the toggles (5) in contact with the underside of the central pivoting lug of the fixture (see Pl.39, fig.3).

In these conditions (clutch in the engaged position) the dimensions obtained should be: "a" = 37 mm between the toggles and the clutch driving plate and "b" = 17.8 mm between the clutch driving plate and the toggle carrier plate (see Pl.39, fig.2)
Lock the nuts by driving the metal into the slots in screws (4) using a chisel .... 14 mm spanner
Fixture 1701-T
Finger, ring and clamp 1704-T
Assembly MR-3457-100

NOTE - If the fixture 1701-T is not available, in an emergency the simplified device, MR-3457-100 (see Pl.40) may be used. In order to ensure that the toggles are properly located, operate the clutch before locking the nuts using a ratchet press.

On this device, the dimension "c" between the top of the toggles and the face plate is 57 mm.

IMPORTANT - The clutch can only be adjusted when in the operating position. The assemblies illustrated in Pl.39 and Pl.40 bring the clutch into this position.
The dimensions indicated can be read only on these assemblies. When the clutch is removed from the assembly the toggles bear on an uneven surface and no exact measurement is possible.

PARTICULAR POINTS.

Adjustments.

1 *Height of the pedal at "a" =* 148^{+5}_{0} *mm (see Pl.41), adjusted by the pedal stop screw.*

2 *Clearance between the fork control rod and the clutch housing at "j" = 1 mm minimum, adjusted by the rear threaded sheath sleeve.*

3 *Clutch clearance = 1·75 to 2·25 mm, measured at the clutch control rod.*

	ADJUSTMENT	TOOLS
1	Check the height of the pedal (see Pl.41):	
	This should be "a" = 148^{+5}_{0} mm from the underside of the pedal pad, the rubber pedal pad removed, to the top of the felt carpet under the rubber carpet.	
	In the contrary case, unscrew the locknut (12) and turn the stop screw (13) to alter the height of the pedal	12 mm box spanner
2	To adjust the length of the sheath:	
	The clearance between the rear end of the fork control rod (2) and the clutch housing should be "j" = 1 mm minimum In order to obtain this dimension move the threaded sleeve (9) by adjusting the nuts (8) and (14).	
3	To adjust the clutch clearance:	
	With a rule, measure exactly the clearance "j" as defined above. Have the clutch pedal depressed by hand by an assistant up to the point where movement becomes hard, this corresponds to the point where the thrust comes into contact with the toggles.	
	In this position measure the new clearance "j'". The difference between these two dimensions (j' - j) should be between 1.75 and 2.25 mm.	
	If this is not the case, unlock the locknut (15) and adjust the nuts (1) and (11). Tighten the locknut (15) and the nut (1)	12 mm spanner and box spanner

TOOLS

REPLACEMENT OF A CLUTCH FORK

Removal (see Pl.49)

1 Remove the gearbox (see Op.ID 330-1).

2 Remove the rubber closing plate from the clutch withdrawal fork opening.

3 Remove the clutch thrust bearing retaining springs (89). Remove the bearing.

4 Remove the retaining screw (91) of the clutch fork shaft (92). Remove the shaft (92), spring (119) and the fork .... 8 mm box spanner

Refitting (see Pl.49)

5 After oiling, insert the shaft (92) in the right hand bore and place the fork, complete with return spring (119) in position. Tighten the retaining screw (91) of the shaft (92) (spring washer under the head) .... 8 mm box spanner

6 Place the thrust ball bearing in position and secure to the fork by means of the springs (89).

7 Fit the rubber closing plate for the clutch withdrawal fork opening.

8 Replace the gearbox and connect to the engine (see Op.ID 330-1).

REPLACEMENT OF A CLUTCH THRUST BALL BEARING

Removal (see Pl.49).

9 Remove the gearbox (see Op.ID 330-1).

10 Remove the springs (89) retaining the thrust bearing. Remove the thrust bearing from its hub (93).

Refitting (see Pl.49)

11 Place the thrust ball bearing in position and secure it to the clutch fork by means of the springs (89).

12 Fit the gearbox and connect it to the engine (see Op.ID 330-1).

REPLACEMENT OF A THRUST BALL BEARING HUB

Removal (see Pl.49)

13 Remove the gearbox (see Op.ID 330-1).

14 Remove the springs (89) securing the thrust ball bearing. Remove the thrust bearing.

		TOOLS
15	Remove the mechanical brake connection cable. Remove the brake cylinder connection pipe (spanner 2221-T, see Pl.61, fig.3)	Spanner 2221-T
16	Remove the brake unit. Sometimes a brake disc must also be removed	12 mm spanner and box spanner 14-19 mm box spanner
17	Drain the gearbox	21 mm box spanner
18	To remove the differential shaft, bearing and brake disc (see Pl.45):	
	a) Remove the screw (1) from the support arm (2). Remove the support arm (2) and remove the four bearing fixing screws (3). Remove the assembly from the gearbox. Remove the adjusting washer (4) and the spacing washer (5). Mark the parts in order to avoid having to readjust differential bearings when refitting	12 mm spanner 14 mm box spanner
	b) Remove the other shaft, bearing and brake disc in the same way.	
	c) Protect the brake discs	Rubber protector
19	Disconnect the clutch housing from the gearbox housing. Remove the differential bearing races from the clutch housing.	
	NOTE - The differential shaft is not in the same plane as the gasket between the housings. The bearing races must therefore be withdrawn only sideways.	
	Hold the differential against the gearbox housing and remove the clutch housing. Remove the differential	12-17 mm spanners and box spanners
20	Remove the fixing screws from the thrust bearing hub (93). Remove the thrust bearing hub and the paper gasket	12 mm box spanner
	Refitting (see Pl.49)	
21	Fit the thrust bearing hub (93) and insert the paper gasket. Tighten the fixing screws and nuts (spring washers under the head of the lower screw)	12 mm box spanner
22	To connect the clutch housing to the gearbox housing:	
	a) Place the differential and crown wheel assembly complete with bearings in the clutch housing. Fit the bearings from the side.	
	b) Secure the clutch housing to the gearbox. Smear the mating faces with "Hermetic" or with linseed oil. Tighten the nuts and bolts	12-17 mm spanners and box spanners
23	To fit the differential shaft, bearing and brake disc assemblies (see Pl.45):	
	a) Place the adjusting washers (4) and spacer washers (5) in their correct positions (marked according to paragraph 18a).	
	NOTE - If the parts were not marked, the differential must be adjusted (see Op.ID 330-3, paragraph 37).	

		TOOLS
	b) Place the paper gasket on the bearing and fit the bearing in position, the oil discharge duct towards the bottom (the longest bearing is fitted on the left). Make sure that the distance piece (114) is fitted. Tighten the bearing fixing screws (3)	
	c) Insert the screws (1) (without tightening them) securing the support arms (2) (plain washers under the heads). On the support arms fit the support fixture 1799-T (see Pl.42) and tighten the support fixture fixing screws. Tighten the support arm fixing screws (1)	Support fixture 1799-T 14 mm box spanner
24	Fit the brake unit	12 mm spanner and box spanner 14-19 mm box spanners
25	Replace the mechanical brake connection cable and the brake cylinder connection pipes (spanner 2221-T, see Pl.61, fig. 3)	Spanner 2221-T
26	Fit the thrust ball bearing and secure to the clutch fork by means of the springs (89).	
27	Fit the gearbox and connect to the engine (see Op.ID 330-1) Fill the gearbox (3.6 pints (2 litres) SAE, 90 EP oil).	

REPLACEMENT OF A SEALING RING (Cyclam)

Removal

28	Remove the gearbox (see Op.ID 330-1).	
29	Disconnect the clutch housing from the gearbox housing (see paragraphs 17 to 19 this operation).	
30	Remove the sealing ring (11) from the drive shaft (20) (see Pl.43).	

Refitting

31	Place the sealing ring (11) in position on the main shaft (20) (see Pl.43)	
32	Connect the clutch housing to the gearbox housing (see paragraph 22 this operation).	
33	Fit the differential shaft, bearings and brake disc (see paragraph 23 this operation).	
34	Fit the brake unit	12 mm spanner and box spanner 14-19 mm box spanners
35	Fit the mechanical brake connection cable and the brake cylinder connection pipe (spanner 2221-T, see Pl.61, fig.3).	Spanner 2221-T
36	Replace the gearbox and secure it to engine (see Op.ID 330-1). Fill the gearbox with 3.6 pints (2 litres SAE 90, EP oil).	

OPERATION No. ID 314-4 : *Replacement of the clutch control*

		TOOLS
	REMOVAL (see Pl.41).	
1	Unscrew the nut (1) and disengage the rod (2) from the clutch fork (3) and the lever (4)	12 mm box spanner
2	Remove the screw securing the lever (4) to the clutch housing. Disconnect the lever (4) from the front socket of the cable (5). Remove the lever (4) and the shouldered spindle (6)	12 mm box spanner
3	Disconnect the cable (5) and its sheath from the sheath retaining boss on the clutch housing. Disconnect the rear socket of the cable (5) from the pedal shaft lever (7). Unscrew the nut (8) and remove the threaded sleeve (9) from the support (10). Remove the control cable assembly	16 mm spanner
	REFITTING	
4	Connect the rear socket of the cable (5) to the pedal shaft lever (7). Place the threaded sleeve (9) in position on the support (10) and screw up the nut (8) without tightening it. Place the cable (5) and sheath in position on the retaining boss on the clutch housing.	
5	Connect the lever (4) to the front socket of cable (5) and place the lever (4) and the shouldered spindle (6) in position after first greasing them lightly. Tighten the fixing nut	12 mm box spanner
6	Connect the rod (2) to the lever (4) and to the clutch fork (3). Screw on the nuts (1) and (11) without tightening them.	
7	Adjust the clutch control (see Op.ID 314-0).	

PARTICULAR POINTS.

Removal.

5 *Remove the steering, after having marked its position in relation to the relays and the steering wheel.*

4-17 *Raise the engine (chain sling 1697–T, stand 1797–T, see Pl.42) and remove the front crossmember (do not mislay the shims fitted between the crossmember and sidemembers). Raise the engine-gearbox assembly, and support the gearbox with lifting tackle (support fixture 1799–T, see Pl.42 and disconnect from the engine.*

Assembly.

18 *Make sure that the dowel pins are in position (on the crankcase) and connect the gearbox to the engine (smear the faces round the oil thrower with "Hermetic").*

30 *Assemble the steering in accordance with the position marks made during removal.*

33 *Fill the gearbox, 3·6 pints (2 litres S.A.E.90 EP oil), fill the radiator with the engine running.*

	REMOVAL	TOOLS
1	Drain the cooling water system. Retain the water which contains anti-freeze mixture. Jack up the front of the car (jacking bracket 2505-T, see Pl.111). Prop the bonnet open (stop MR-4158, see Pl.16, fig.1)	Jacking bracket 2505-T Stop MR-4158
2	Remove the spare wheel, the spare wheel support, the front wings, the air deflector panel and the brake cooling ducts.	8-12-14 mm spanners and box spanners
3	Remove the battery and the battery tray. Remove the exhaust down pipe and its bracket. Remove the distance piece from the support on the radiator side	12-14 mm box spanners
4	Disconnect the rubber inlet and outlet hoses from the radiator. Remove the radiator tie bar. Remove the screws securing the radiator to the crossmember. Remove the radiator and the rubber blocks on the engine support crossmember. Disconnect the flexible intake hose from the water pump. Remove the steel pipe. Remove the heating and demisting radiator support fixing screws and disengage the radiator and rest it on the right hand sidemember	8-12-14 mm box spanners
5	To remove the steering assembly (see Pl.90 and 93): a) Mark the position of the steering pinion in relation to the flexible coupling (dab of paint on the steering pinion at "a" opposite the locking groove). Mark the lateral position of the steering assembly in the bearings at "b" with paint.	

		TOOLS
	b) Disconnect the steering levers (1) from the relay shafts. Remove the steering pinion retaining screw (2). Remove the bearing caps and remove the steering assembly, withdrawing it from the left hand side of the car	12-14-16 mm box spanners
6	To remove the dynamo: Disconnect the wires from the regulator terminals. Disconnect the tie bar from the dynamo. Unscrew the front fixing screw and remove the rear fixing screw. Remove the belt and withdraw the dynamo	12 mm box spanner 14 mm spanner and ring spanner
7	Remove the driving pulley (do not mislay the key and the adjusting washer). Hold the shaft in position with a clamp held by the pulley fixing screw, in order to prevent the shaft from being pushed back when the gearbox is removed	14 mm box spanner
8	Disconnect the feed pipe from the left hand brake (spanner 2221-T see Pl.61, fig. 3). Seal the openings in the pipe and the movable brake shoe (see Pl.89). Disconnect the front brake connection pipe clip from the water pump	Spanner 2221-T 12 mm spanner
9	Disconnect the hand brake control (see Pl.99): Disconnect the connecting cable (1) from the right hand lever. Disconnect the control cable (3) from the left hand levers (4 and 5).	
10	Remove the clutch fork control rod (2) (see Pl.41). Remove the sheath from its guide on the clutch housing and remove the cable (5)	12 mm spanner and box spanner
11	Disconnect the change speed selector control from the gearbox cover (see Op.ID.334-1, paragraphs 5 to 10).	
12	Disconnect the speedometer cable from the gearbox	12 mm box spanner
13	Remove the front wheels. Disconnect the flexible couplings (Bibax) from the gearbox driving plate	12 mm socket with extension
14	Place a rubber covered chain sling under the water pump cover and raise the engine (chain sling 1679-T and stand 1797-T, see Pl.42)	Chain sling 1697-T Stand 1797-T
15	Remove the front engine support crossmember (do not mislay the shims between the crossmember and sidemembers)	14 mm box spanner
16	Place the support fixture 1799-T on the gearbox (see Pl.42) and raise the engine and gearbox assembly to enable the box to be released from the crossmember between the sidemembers. Place the engine on stand 1797-T (see Pl.42) and support the gearbox with lifting tackle in order to avoid damaging the clutch shaft or the clutch disc when the gearbox is disconnected from the engine	Support fixture 1799-T Stand 1797-T

		TOOLS
17	Remove the clutch housing fixing screws (spanner 1677-T, see Pl.54, fig.4, and spanner 2431-T, see Pl.61, fig.1)	
	Disconnect the gearbox	Spanners 1677-T and 2431-T
	REFITTING	
18	Place the support fixture 1799-T on the gearbox (see Pl.42)	Support fixture 1799-T
	Make sure that the gearbox locating dowels are in position on the engine Place the paper gasket (52) (see Pl.1), after applying Hermetic to it, on the crankcase, in the area below the oil thrower. Align the gearbox with the engine. Engage the clutch shaft splines in the clutch disc, rotating the shaft by means of the starting handle, and if necessary also rotate the drive pulley in order to facilitate engagement of the splines.	
	Insert the gearbox fixing screws (spanner 1677-T, see Pl.54, fig.4, and spanner 2431-T, see Pl.61, fig.1)	Spanners 1677 and 2431-T, Support fixture 1799-T
19	Fit and align the drive pulley (see Op.ID 231-4).	
20	Remove support fixture 1799-T from the gearbox and place the crossmember on the gearbox brackets. Connect the adjustment rods (6) to the yokes (7) of the brake units (see Pl.99 for position). Place the crossmember on its supports, tighten the fixing screws and turn down the locking devices. Lower the engine and gearbox assembly until the crossmember just rests on the sidemembers.	
	Withdraw chain sling 1697-T	14 mm box spanner
21	Fit the shim or shims, found during the dismantling operation, between the crossmember and the sidemembers. Tighten the screws securing the crossmember to the sidemembers (plain and spring washers under the heads) ..	14 mm box spanner
22	To adjust the height of the brake units (see Pl.99): Adjust the length of the rods (6) until the front of the linings stands slightly proud of the disc (about 1 mm). Tighten the adjusting nut (9) of the brake connecting cable (1) until the control levers (2 and 5) are at the maximum distance from the eccentric stop (8). Lock the locknut (10). Push the short lever (4) with a screwdriver and attach the mechanical brake control cable (3).	
23	Connect the feed pipe to the left hand brake (spanner 2221-T, see Pl.61, fig.3).	
	Secure the connecting tube clamp to the water pump	Spanner 2221-T 12 mm spanner
24	Connect the flexible couplings (Bibax) to the gearbox driving plate. Make sure that the locating dowels are in position in their housing in the flexible couplings. Tighten the screws to 18 ft.lbs (2.5 m.kg)	12 mm socket with extension

		TOOLS
25	Connect the speedometer cable to the gearbox	10 mm box spanner
26	Connect the clutch control cable to the lever and place the sheath in the guide on the clutch housing Connect the rod to the lever and to the clutch fork	12 mm spanner and box spanner
27	Adjust the clutch control (see Op.ID 314-0).	
28	Connect the change speed selector control to the box cover and adjust the gear selector (see Op.ID 334-1, paragraphs 12 to 20).	
29	Fit the dynamo. Insert the rear fixing screws (plain and spring washers under the heads). Place the belt in position. Secure the tie bar to the dynamo (plain and spring washers under the heads). Tighten the belt, tighten the tie bar nut and the dynamo fixing screws. Connect the leads to the regulator terminals	12 mm spanner and box spanner 14 mm spanner and ring spanner
30	To refit the steering assembly (see Pl.90 and 93):	
	a) Position the pinion in accordance with the reference mark made during the dismantling operation (dab of paint at "a" opposite the groove of the flexible coupling). Engage the drive pinion in the flexible coupling screw and tighten the nut. Place the steering assembly in its bearings in accordance with the reference paint marks made during dismantling operations (at "b"). Insert the bearing cap fixing screws (spring washers under heads). Connect the levers (1) to the relays (place the coupling screw nuts on the inside)	12-14-16 mm box spanners
	b) Compress the spring (3) (see Pl.91, fig.2) (spring compressor 1991-T, see Pl.91, fig.1). When the spring is fully compressed, tighten the screw (4) of collar (5) (spanner 1994-T, see Pl.91, fig.3). Make sure that there is no play by alternately pulling and pushing the steering wheel. Fit the cover on the instrument panel. Tighten the fixing screws (cup washers under the heads). Turn the steering wheel and tighten the bearing cap fixing screws	Spring compressor 1991-T Spanner 1994-T 12 mm box spanner
31	To fit the radiator:	
	a) Place the rubber blocks in the cups on the crossmember. b) Place the radiator in position and connect the flexible hoses to the radiator and to the water pump. c) Place the exhaust down pipe bracket in position, insert the distance piece under the bracket on the radiator side. Insert but do not tighten the radiator and bracket fixing screws (spring washers under heads).	

		TOOLS
	d) Centre the radiator making sure that the fan blades do not touch the cowling. Tighten the fixing screws of the radiator and the bracket.	
	e) Fit the radiator tie-rod (plain and spring washers under the head of the screw). Fit the heating and demisting radiator and support assembly. Tighten the fixing screws (plain and spring washers under heads). Connect the flexible air hose to the radiator tie bar. Fit a Ligarex clip (pliers 2483-T, see Pl.17, fig.2)	12-14 mm box spanners Pliers 2483-T
32	Fit the exhaust down pipe. Tighten the collars (spring washers)	12 mm box spanner
33	Fill the gearbox: 3.6 pints (2 litres SAE 90, EP oil).	
34	Fit the brake disc cooling ducts. Make sure that they do not touch the discs; if necessary shift them slightly.	
35	Fit the air deflector panel, the front wings, the spare wheel support and the spare wheel. Refit the front wheels. Tighten the screws to 108-144 ft.lbs (15-20 m.kg)	12-14 mm spanners and box spanners
36	Fit the battery tray. Fit and connect the battery. Lower the car to the ground	12 mm box spanner
37	Fill the radiator, with the engine running.	
38	Bleed the front brakes (see Op.ID 453-0).	

		TOOLS
	STRIPPING (see Pl.49)	
1	Remove the mechanical brake connecting cable (1) (see Pl.99). Remove the brake cylinder connecting pipe (spanner 2221-T or 2219-T, see Pl.61, fig.3)	Spanner 2219-T or 2221-T
2	Remove the brake units and the rear supports. It may sometimes be necessary to remove a brake shoe	12 mm spanner and box spanner 14-19 mm box spanners
3	Remove the flange fitted to hold the fan, dynamo and pump driving shaft during removal. Extract the pin and remove the castle nut (86) (spanner 1640-T, see Pl.55, fig.5) Remove the drive shaft and bearing assembly from the front. Remove the greaser, if fitted. Remove the starter motor contact nose screws	Spanner 1640-T 8-12 mm box spanners
4	Remove the earth lead and the end thrust block and support assembly (115) (see Pl.48)	14 mm box spanner
5	Drain the gearbox	21 mm box spanner
	ASSEMBLY (see Pl.48 and 49)	
6	Fit the drive shaft and bearing assembly (87). Grease the assembly. Tighten the castle nut (86) (spanner 1640-T, see Pl.55, fig.5) and insert the split pin. Drill a 2.5 mm dia. hole if there is not one opposite a recess	Spanner 1640-T
7	Fit the greaser. Fit a front dynamo fixing screw without tightening (plain and spring washer under head). Fit the starter motor nose contact screws and locknuts	14 mm box spanner
8	Fit the brake units: a) Fit the brake units and rear support assemblies. Tighten the fixing screws and insert a locking piece (see Pl.100, fig.1). If necessary, open the shoes (fork 2128-T, in order to release the pawl, and spanner 2129-T to separate the shoes) (see Pl.101, fig.1) or remove the shoes (spanner 2127-T, see Pl.101)	14-19 mm box spanners Spanner 2127-T Fork 2128-T Spanner 2129-T
	b) After replacing, take up the play by adjusting the control lever (4) or by placing the shoes in position. Secure them by means of the trunnion (11) and the fixing screw (12) (see Pl.99 and 100).	
9	Fit the brake cylinder connecting pipe. Tighten the unions moderately (spanner 2219-T or 2221-T, see Pl.61, fig.3). Make sure that the drain plug is tightened	Spanner 2219-T or 2221-T
10	Fit the mechanical brake connecting cable (1) (see Pl.99).	
11	Fit the end thrust block and support assembly (115) (see Pl.48)	14 mm box spanner

PARTICULAR POINTS.

Dismantling.

14 *Strip down the mainshaft. The needle bearing assemblies are not of the same length; make sure that the position of the sliding gear is marked (blue paint 4th speed side) if not mark before dismantling.*

15 *Strip down the intermediate train, dismantle the differential.*

In order to remove the assembly of the retaining and thrust washer, heat the thrust washer to 290 F (200 C) (using a blow pipe fitted with a 150 to 200 litre nozzle).

Assembly

21 *The rear end of the clutch thrust guide stud should be set at a distance "a" = 97 ± 1 mm from the face of the joint with the engine.*

22 *To prepare the gearbox cover.*

The lateral clearance on the fork shaft control levers = 0·15 to 0·25 (shim).

Calibration of locking spindle spring: length = 52 mm under load of 29 ± 1·5 kg.

24 *To prepare the differential.*

Fit the bearings, a satelite (thrust washer) and a planet wheel (fibre washer housing side); lateral clearance of satelite = 0·35 mm maximum; adjust the other satelites in a similar manner; fit the second planet wheel and the crown wheel (tightening torque 43·5 ft.lb (6 m.kg), for cars delivered before Jan. 1960 and 36 ft.lb (5 m.kg), for cars delivered after January 1960; side clearance of planet wheel = 0·35 mm maximum.

25 *To prepare the differential shafts.*

Reface the brake discs (shaft mounted between centres) by grinding or using a facing tool, avoid removing in order to reface the second face, difference in thickness at any point on the disc 0·03 mm maximum, maximum "run out" at the greatest diameter: 0·17 mm. Do not reduce the original thickness of the disc by more than 0·5 mm on each face (original thickness = 12 ± 0·1 mm).

26 *To prepare the shaft and bearing assemblies.*

Fit the bearing in the housing, tighten the nut to 72 ft.lb (10 m.kg) (spanner 1771–T), fit the oil seal (mandrel 1772–T), fit this assembly on the differential shaft (using a press), tighten the shaft nut to 72 ft.lb (10 m.kg) (spanner 1770–T), tighten the screw locking the nuts.

27 *To prepare the mainshaft.*

Fit the 3rd and 4th sliding pinion, the face with the groove towards the 3rd and 4th speed (note the paint marks on the 4th speed side).

Fit the ball pads (clearance = 0·04 to 0·25 mm); there are three thicknesses of ball pads, the thickness can be different on the same synchro.

Fit the 3rd speed pinion, its needle bearing cage, the synchro bush, the half segments locking the pinion (maximum clearance 0·04 mm), the retaining washer. Fit the 2nd speed pinion, its needle bearing cage, the synchro bush, the synchro hub (carrying the driving pins); clearance of the synchro bush = 0·20 to 0·65 mm. Fit the 1st speed driving pinion, the rear bearing, the circlips (clearance = 0·04 mm maximum).

Adjust the front bearing cap (clearance = 0 between the collar and the thrust face on the cap).

28 *To prepare the bevel pinion shaft.*

Adjust the front bearing cap (clearance = 0 between the collar and the thrust face on the cap).

31 *Assemble the reverse gear, the machined face for the thrust balls on the pinion side, lateral clearance for the assembly = 0·05 to 0·20 mm. Make sure that the screw is fitted in the spindle at the front (smear the screw with hermetic).*

33 *To fit the bevel pinion shaft.*

Fit an adjusting shim and the front bearing. Fit the 1st speed lever spindle (copper joint).

Tighten the starting handle dog to 87 ft.lb (12 m.kg) (lockwasher). Tighten the bevel pinion shaft nut to 144 ft.lb (20 m.kg).

Adjust the bevel pinion shaft (bevel pinion setting) (adjusting fixture 2044–T and dial gauge, see Pl.50).

36 *Put the tubular distance piece on the mainshaft together with a shim which will give a dimension (e – d) = $16{\cdot}2\,^{+1}_{\;0}$ mm, when the clutch bell-housing and gearbox casing are connected, for the fitting of the sealing joint (see Pl.43).*

38 *Fit the differential (see paragraph 38).*

		TOOLS
	DISMANTLING (see Pl.43).	
1	Fit the gearbox on a stand (stand MR-3053-130, see Pl.53). Remove the cover	Stand MR-3053-130 14 mm box spanner
2	To remove the shaft bearing-housing assembly and the brake disc (see Pl.45):	
	a) Remove the screws (1) fixing the bracket (2). Remove the bracket and take out the four screws (3) fixing the bearing housing. Remove the assembly from the gearbox casing. Remove the adjusting washer (4) and the spacing washer (5).	12 mm spanner 14 mm box spanner
	b) In the same way remove the other shaft bearing-housing assembly and brake disc.	
	c) Protect the brake discs	Rubber protector
3	Uncouple the clutch bell housing from the gearbox casing.	
	Remove the bearing races from the clutch bell-housing.	
	NOTE - The centre of the differential is not on the line of the joint, between the clutch bell-housing and the gearbox casing; for this reason the bearing races can only be taken out sideways.	
	Hold the differential against the gearbox casing and remove the clutch bell-housing.	
	Take out the differential	12-17 mm spanner and box spanner
4	Remove the top bearing cover plate (6) and the lower bearing cover plate (7).	
	Save the adjusting shims (8)	14 mm box spanner
5	Put two gears in mesh. Remove the starting handle dog (9) and the nut (10) locking the bearings (spanner 1734-T, see Pl.54, fig.3)	Spanner 1734-T
6	Remove the rear oil seal (11) from the mainshaft, the washer (12), the distance piece (13), the circlips (14) (use circlip pliers).	
	Remove the shim (15), the bearing (16), the 1st speed pinion (17)	Circlip pliers
7	Loosen the front bearings (18 and 19) by striking on the rear end of the mainshaft (20) and on the bevel pinion shaft (23) with a mallet. Extract the bearings (extractor 1750-T, fitted with shell grips and pressure pad 1738-T, see Pl.57, fig.1)	Extractor 1750-T Shell grips 1738-T
8	Remove the spindle (21) from the 1st speed selector fork lever (98) (see Pl.48) and push the fork towards the rear	21 mm box spanner
9	Drive out the bevel pinion shaft (23) by striking the end with a bronze drift. Remove the bevel pinion shaft.	

TOOLS

10 Remove the assembly of mainshaft and pinions through the top of the gearbox casing.

11 Remove the intermediate train pinions and remove the 1st speed selector fork.

12 To remove the reverse gear layshaft (see Pl.45):
Untighten the locknut (24) and remove the screw (25) locking the spindle (26).
Drive out the steel plug (27) blocking the hole for the spindle in the front face of the gearbox casing.
Draw out the spindle (26) by means of a 7mm dia. x 100 screw.
Remove the assembly of the reverse gear layshaft, the ball thrust race (28), the adjusting shims (29), the needle bearing assemblies (30) and their distance piece (31) .... 12 mm box spanner

13 Remove the speedometer pinion, the filler and drain plugs .... 12-21 mm box spanners

14 To strip down the mainshaft (see Pl.44):

a) Disengage the 4th speed loose pinion (32) and the bronze bush (33) from the synchromesh. Remove the 2nd speed synchromesh assembly (34).

NOTE - Do not pull the synchromesh by the collar, otherwise the driving pins (35) will escape from the pinion. Do not mislay the adjusting shims (36) found between the synchromesh and the pinion.

b) Disengage the 2nd speed loose pinion (37), the washer (38) retaining the half segments (39), the half segments of the 3rd speed loose pinion (40), the synchromesh bronze bush (41).

c) Remove the needle bearing assemblies from the loose pinions. (Note: these needle bearing assemblies are not of the same length).

d) To remove the 3rd and 4th speed synchro collar:
Make sure that the position of the collar (42) in relation to the hub (43) is marked by a stroke of blue paint, if not make a mark.
Push the collar, without force, towards the front.
By holding the collar, bring the synchro ball pads (44) towards the rear.
Remove the collar towards the front. (Take care not to lose the balls and springs during this operation).

15 To strip down the intermediate train (see Pl.44, fig.2):

Using levers, separate the 2nd speed intermediate pinion (45) from the 3rd and 4th speed intermediate pinion (46). Take out the driving pins (47).

16 To dismantle the differential (see Pl.45):

Uncouple the crown-wheel (48) from the differential housing (49).
Remove the planet wheel (50) from the crown-wheel. Remove the spindles for the satelite wheels, the bush (51), the satelite wheels (52) and their thrust washers (53), the other planet wheel (54) and the fibre washer (55).

		TOOLS
	Remove the taper roller bearings from the differential housing and from the crown-wheel (extractor 1750-T with shell grips 1753 and pressure pad 1742-T, see Pl.52, fig.1)	17 mm box spanner Extractor 1750-T Shell grips 1753-T Pressure pad 1742-T
17	To strip down the differential shafts (see Pl.45):	
	a) Unscrew the screw (56) retaining the nut (57) locking the bearing (58) on the differential shaft. Remove the nut (57) (spanner 1770-T, see Pl.55, fig.4). Drive out the shaft and disc assembly and remove the support arm (2) from the bearing	7 mm box spanner Spanner 1770-T
	b) Remove the screw (60) retaining the nut (61) locking the bearing (58) in the housing. Remove the nut (61) (spanner 1771-T, see Pl.55, fig.3). Remove the oil seal (62) and drive out the bearing (58) from the housing	12 mm spanner Spanner 1771-T
	c) To remove the assembly of the retaining washer (63) and thrust washer (64) from the differential shaft. Heat the thrust washer to 390° F (200° C) approximately, using a blow pipe fitted with a 150 to 200 litre nozzle. Assist the removal of the thrust washer with a screwdriver if necessary.	
18	To strip down the cover plate (see Pl.46 and 47): Remove the circlip (65) retaining the locking spindle (66). Remove the locking spindle Remove the cup (67) and the spring (68) from the locking spindle (spring compressor 1792-T, see Pl.57, fig.4). Remove the circlip (69) and the support tube (70). (Be careful not to lose the springs and locking balls during the operation). Remove the ring seal (71) from the support tube (70). Remove the screws (72), the springs (73), the balls (74) locking the selector fork shafts. Remove the selector shaft stop screws (75) and their locknuts (76) (spanner MR-3691-80, see Pl.57, fig.2). Untighten the screws fixing the forks. Remove the adjusting shim (77), the distance pieces (78 and 82) and the fork shaft control levers (79, 94 and 95). Remove the fork shafts and the forks, the locking rocker (80) and the locking plugs (81). Remove the sealing plug (83)	Spring compressor 1792-T 17-21 mm box spanners Spanner MR-3691-80 9 mm spanner
19	To strip down the clutch bell housing (see Pl.49):	
	a) To remove the driving pulley: Remove the screw (84) and disengage the pulley and the key (85). Remove the nut (86) locking the bearing (87) (spanner 1640-T, see Pl.55, fig.5).	

		TOOLS
	Drive the shaft and bearing assembly towards the front. Disengage the bearing (87) and the oil retaining washer (88)	14 mm box spanner Spanner 1640-T
	b) Remove the circlips (89) retaining the clutch thrust and remove the clutch thrust and support assembly. Remove the clutch thrust guide stud (90) and its locknut	14 mm box spanner
	c) To remove the clutch withdrawal fork: Remove the dust cover. Remove the locking screw (91) and drive out the spindle (92). Disengage the return spring (119). Remove the thrust race support hub (93)	8-12 mm box spanners
	d) Remove the starter motor reaction screws, the greaser and the dynamo fixing screws	8-12 mm box spanners
20	Clean the parts.	
	ASSEMBLY	
21	To prepare the clutch bell housing (see Pl.49):	
	a) Fit the thrust race support hub (93) inserting a paper joint. Tighten the screws and fixing nuts (spring washer under the head of the lower screw). Fit the clutch thrust guide stud (90) together with its locknut. Adjust the position of the screw so that its end is set at a dimension "a" = 97 ± 1 mm from the face of the joint with the engine. Tighten the locknut	12 mm box spanner
	b) To fit the clutch fork: Engage the spindle (92) previously oiled in the right hand bore and offer up the fork, fitted with its return spring. Tighten the locking screw (91). Tighten the nut (plain washer). Fit the dust cover. Put the clutch thrust race in position, then fix to the fork using the circlips (89)	8 mm box spanner
	c) To fit the driving shaft: Put the bearing (87) previously greased in the bore in the clutch bell housing. Tighten the nut (86) and fit a split pin (spanner 1640-T, see Pl.55, fig.5). Place the oil retaining washer (88) on the shaft and engage the assembly in the bearing (87). Fit the key (85) and the pulley. Tighten the fixing screw	Spanner 1640-T
	d) Fit the greaser, the dynamo fixing screw, the starter motor reaction screws and their locknuts.	

TOOLS

22 To adjust the position of the driving pulley (see Pl.58):

a) Use the fixture 1683-T.
Fit the gauge pin bracket (B) with the face marked "2 pulleys" towards the front, and fit the bracket on the boss provided for fixing the high pressure pump on the DS.19 .... Fixture 1683-T

b) Place the rod (A) with the ball end resting on the lateral faces of the driving pulley groove, and the rod itself bearing on the gauge pins (C) in the zones "f" and "g".

NOTE - If the pulley is correctly aligned, with the rod bearing on the gauge pin at "g" the gap should be **0.45** ± 0.25 mm in the zone "f".

c) Using a set of feeler gauges, measure the gap between the gauge pin and the rod.

Ist. case:

The rod bearing on the gauge pin at "f". Reduce the thickness of the pulley adjusting washers by three times the amount of the gap "d" measured at "g", plus 0.45 x 2 = 0.90 mm, in order to obtain a gap of 0.45 ± 0.25 mm at "f". The pulley is then adjusted correctly.

Example 1 - Gap "d" measured at "g" = 0.3 mm. It will be necessary to reduce the thickness of the pulley adjusting washers by (0.3 x 3) + (0.45 x 2) = 0.90 + 0.90 = 1.80 mm.

2nd. case:

The rod bearing on the gauge pin at "g". If the gap measured at "f" is greater than 0.45 ± 0.25 mm, it will be necessary to increase the thickness of the pulley adjusting washers by twice the difference between the gap measured and 0.45 mm.

Example 2 - Gap "d" measured at "f" = 0.80 mm. It will be necessary to increase the thickness of the pulley adjusting washers by (0.80 - 0.45) x 2 = 0.35 x 2 = 0.70 mm.

3rd. case:

If the gap "d" measured at "f" is less than 0.45 ± 0.25 mm, it will be necessary to reduce the thickness of the pulley adjusting washers by twice the difference between 0.45 mm and the gap measured.

Example 3 - Gap "d" measured at "f" = 0.25 mm. It will be necessary to reduce the thickness of the pulley adjusting washers by (0.45 - 0.25) x 2 = 0.20 x 2 = 0.40 mm.

d) Remove the pulley. Remove the washer or washers and measure the thickness and select one or more washers of suitable thickness from those sold by our Spare Parts Department.

e) Fit the adjusting washer or washers, the key and the pulley. Tighten the screw fixing the pulley (spring washer under the head) .... 14 mm box spanner

f) Remove the gauge pin bracket (B).

TOOLS

23 To prepare the gearbox cover (see Pl.46 and 47):

a) Use the mandrels 1793-T (see Pl.56).
Insert the mandrel (A), through the right hand side of the gearbox cover.
Fit the reverse speed fork shaft control lever (94) (see Pl.46 for positioning the levers).
Fit one distance piece (82), the 3rd and 4th speed fork shaft control lever (95), one distance piece (82), the 1st and 2nd speed fork shaft control lever (79), the distance piece (78) and the circlip (69).
Using a set of feeler gauges, measure the clearance "b" between the thrust face of the cover and the circlip (69).
Select a shim of appropriate thickness from those sold by our Spare Parts Department, in order to obtain a clearance of between 0.15 and 0.25 mm ....

Mandrel 1793-T

b) To fit the forks (see Pl.46 and 47):
Remove the circlip (69), the shim (77), the distance piece (78).
Engage the locking plungers (81), the 1st and 2nd speed fork shaft (96), fit the fork (97) on the shaft. Put the control lever (79) in position in the groove on the shaft.
Engage the 3rd and 4th speed fork shaft (99), fit the locking rocker (80), fit the fork (100) on the shaft and put the control lever (95) in position in the groove on the shaft. Tighten the screw fixing the fork.
With the shafts (96) and (99) in the "neutral" position push the reverse gear shaft (101) towards the rear of the cover.
Engage the fork (102) on the shaft and put the lever (94) in position in the groove on the shaft.
Tighten the screws fixing the forks (97) and (102).
Lock the screws with iron wire, fitted in such a way, to avoid any rotation in the direction of unscrewing.
Fit the locking balls (74), the springs (73) and the screws (72) (copper joint under the head) ....

9 mm spanner
17 mm spanner and
box spanner
Mandrel 1793-T

c) Fit the distance piece (78) and the shim (77) on the portion (A) of the mandrel 1793-T (see Pl.56, fig.1).
Fit the ring seal (71) on the support tube (70).
Fit the portion (B) of the mandrel 1793-T in the support tube (see Pl.56, fig.2).
Put the 18 balls (103) in the tube, hold them in position with grease.
The shafts of the forks being in the neutral position, engage the assembly of the mandrel (B) and tube (70) in the cover of the gearbox.
Then push on the mandrel (A) with the tube(70) (see Pl.56, fig.3).
Fit the circlip (69) in the groove of the tube (70) between the distance piece (78) and the shim (77).
Check the calibration of the spring (68): under a load of 29 ± 1.5 kg. the length should be 52 mm. (Fixture for calibrating springs 2420-T, see Pl.6, fig.1) ....

Fixture for calibrating
springs 2420-T

Fit the spring (68) and the cup (67) on the locking spindle (66) (spring compressor 1792-T, see Pl.57, fig.4)....

Spring compressor
1792-T

Engage the locking spindle in the support tube (70) and with the latter push out the mandrel (B) (see Pl.56, fig.4).
Fit the circlip (65) retaining the locking spindle.
Fit the sealing plug (83) with "Hermetic".

TOOLS

Screw in the threaded stop screws (75) for a few threads into the fork shafts and fit their locknuts (76). Put the shaft (96) in 1st speed position, screw in the threaded stop screw in order to bring it against the shaft, unscrew the socket one quarter of a turn and lock the locknut (spanner MR-3691-80, see Pl. 57, fig. 2). Carry out the same operation for the 2nd speed position (shaft 96) and for the reverse speed shaft (101) ....

Spanner MR-3691-80
21 mm spanner

IMPORTANT NOTE - The shaft (99) of the 3rd and 4th speed is adjusted when the cover is mounted on the gearbox.

NOTE - On cars delivered after January 1960, this adjustment is unnecessary.

24 To prepare the differential (see Pl. 45) :

a) Fit the taper roller bearings on the crown wheel and differential housing (mandrel 1768-T, see Pl. 52, fig. 2)..

Mandrel 1768-T

b) Fit the fibre washer (55) on the differential housing (oil grooves towards the planet wheel) and a planet wheel (54). Fit a satelite spindle, a thrust washer (53) (the locking tab in the notch in the housing). Fit a satelite wheel. Determine the thickness of the thrust washer for this satelite so that there is no stiffness when turning the planet wheel which should have a longitudinal clearance of 0.35 mm maximum. Carry out the same operation for the other satelites, fit the bush (51).

c) Fit the second planet wheel (50) and the crown wheel (48), the spindles for the satelite wheels are locked by set screws. Tighten the screws to 43.5 ft.lbs (6 m.kg) (*for cars delivered before January 1960*) or 36 ft.lbs (5 m.kg) (*for cars delivered since January 1960*). Make sure that there is no stiffness when turning the planet wheel. The longitudinal clearance on the planet wheel is 0.35 mm, if not, try another planet wheel ....

17 mm box spanner

d) Dismantle the differential housing. Mark the parts, oil and refit *On cars delivered before January 1960* : lock the screws by means of a wire so as to prevent unscrewing (see Pl. 50, fig. 3). *On cars delivered since January 1960* (with 8 x 31 crown wheel and pinion) there are no lockwashers for the screws. Tighten them to 36 ft.lbs (5 m.kg).

25 To prepare the differential shafts (see Pl. 45) :

a) To reface the brake discs :

Mount the shaft between centres, the disc at the tailstock end, drive by means of a lathe carrier or dog.

Face up the disc face using a facing tool, or better still, a grinding wheel.

If the lathe permits, face up the other face of the disc without removing, if not, screw a stud in one of the holes for fixing the Bibax and reverse the assembly between the lathe centres.

Reface the other face.

b) To check the disc faces. They should conform to the following conditions :

Maximum "run out" at the greatest diameter: 0.17 mm at two diametrically opposite points.

TOOLS

Difference in thickness of any point on the disc: 0.03 mm.

NOTE - Do not reduce the original thickness of the disc (12 ± 0.1 mm) by more than 1 mm.

c) Put the oil retaining washer (63) on the shaft. Offer up the distance piece (64), put the mandrel 1767-T in position (see Pl. 55, fig. 1). Cap the oil sealing washer with the centring bush (A) of the mandrel and fit the distance piece in a press (see Pl. 55, fig. 1).

Put a block under the disc in order to avoid damage to the dowel pins ....

Mandrel 1767-T

26 To prepare the shaft and bearing assemblies (see Pl. 45) :

NOTE - The differential shaft and housing are shorter on the right-hand side.

a) Put the bearing (58) in the housing, tighten the ring nut (61) to 72 ft.lbs (10 m.kg) (spanner 1771-T, see Pl. 55, fig. 3).
Lock the nut with the pointed screw (60) ....

Spanner 1771-T
12 mm box spanner

b) Fit the oil seal (62) (mandrel 1772-T, see Pl. 55, fig. 2). Ease the fitting of the joint in the bush and the housing with petrol, use no other products ....

Mandrel 1772-T

NOTE - During the manipulation of the joint, be careful not to damage the face of the oil seal. One scratch made even with a finger nail is sufficient to cause a leakage.

c) Offer up the housing thus prepared, together with the bracket (2) on the differential shaft. Put it in position, in a press, using a tube.

Tighten the nut (57) locking the bearing on the shaft to 72 ft.lbs (10 m.kg) (spanner 1770-T, see Pl. 55, fig. 4).

Tighten the screw (56) locking the nut ....

Tube :
Internal dia. = 30 mm
External dia. = 39 mm
Length = 200 mm
Spanner 1770-T
7 mm box spanner

27 To prepare the mainshaft (see Pl. 44) :

IMPORTANT NOTE - (see Pl. 44 A and table overleaf).

Ever since the car was first produced, we have adopted successively 3 types of assembly for the 3rd and 4th gears. The table on the following page will permit identification of the different parts.

TOOLS

Type of gearbox	Driveshaft with 3rd & 4th gear synchro	3rd gear pinion	4th gear pinion	Intermediate gear train	Synchro bushes	Ball pads
Cars delivered before July 1957. 3rd gear pinion at 31° 50'. Tooth engagement at 15° on 3rd and 4th gear dogs.	DM 332-01 Width of synchro collar: 24.5 mm. max.	DM 333-8 1 groove in "a".	DM 333-17 1 groove in "b".	D 333-16 no marks.	DM 335-16 Tooth engagement at 15°. In all cases only fit thick bushes.	DM 335-70d thickness : 5.25 mm. DM 335-70e thickness : 5.35 mm. DM 335-70f thickness : 5.45 mm. Length : 22.4 max.
Cars delivered between July 1957 and January 1959. 3rd gear pinion at 33° 30'. Tooth engagement at 15° on 3rd and 4th gear dogs.		DM 333-8a 1 groove in "a". 1 groove in "c".		DS 333-16 Number "33" marked on face "f".		
Cars delivered since January 1959. 3rd gear pinion at 33° 30'. Straight tooth engagement on 3rd and 4th gear dogs. .	DM 332-01a Wider synchro collar. 25.5 mm min.	DM 333-8b 1 groove in "a". 1 groove in "c". Splines visible in "e".	DM 333-17a 1 groove in "b". Splines visible in "d". 1 tooth in 5 removed from dogs.		DM 335-16a Straight tooth engagement. Thick bushes.	DM 335-70a thickness : 5.2 mm. DM 335-70b thickness : 5.3 mm. DM 335-70c thickness: 5.4 mm. Length: 23.2 mm. min.

a) To fit the 3rd and 4th speed synchro collar:
Fit the 3rd and 4th speed synchro collar (42) on the hub (43), the shouldered face towards the 3rd speed and corresponding to the paint marks.

b) Determine the thickness of the ball pads. Fit a ball pad (44) of one thickness (for example 5 mm) in a housing. With a set of feeler gauges, measure the clearance "f" of the ball pad in its housing; take this measurement by sliding the feeler gauge between the ball pad and the hub (for example 0.35 mm), this gives the height of the housing as 5 + 0.35 = 5.35 mm.
Knowing that the ball pad should have a clearance of 0.04 to 0.25 mm, select a ball pad which will permit a minimum clearance being obtained, therefore in the example select a ball pad with a thickness of 5.25 mm.

NOTE - Mark the housing so that it corresponds to the thickness of the ball pad determined above and recommence the same operation for the other two ball pads (the thickness of the three ball pads can be different).

TOOLS

c) To fit the ball pads:
For each ball pad, proceed in the following manner, the sliding gear being approximately in the 3rd position. Put the spring (104)in the hole in the hub. Place a ball in the hole in the ball pad corresponding to that of the hub, at the same time holding it by hand. Press on the spring with the end of the ball pad then push fully on to the hub by engaging in its housing. Push the ball pad until the spring is resting on the ball.

d) Fit the 3rd speed loose pinion (40) fitted with its needle bearing cage and the bronze bush (41). Make sure that a clearance exists between the bronze bush and the front face of the pinion, the cones being in contact. Select from the half segments (39), sold by our Spare Parts Department, those which are slightly tight or which have a maximum play of 0.04 mm in the groove in the shaft. Fit the half segment retaining washer (38).

e) Fit the 2nd speed loose pinion (37) fitted with its needle bearing cage.
Fit the synchro bush and the synchro hub carrying the driving pins, the collar with the greater thickness, to be fitted towards the front.

f) To adjust the movement of the synchro bush:
Hold the synchro hub (34) against the 2nd speed loose pinion (37) (shoulder of shaft) by hand.
With the bush of the synchro in contact with the cone of the 2nd speed loose pinion, using a set of feelers, measure the clearance between the rear face of the synchro bush and the front face of the reverse speed pinion.
Select a shim (36) from those sold by our Spare Parts Department to give a clearance of between 0.2 and 0.65 mm.

g) Fit the shim (36), the synchro hub (34), the 1st speed pinion (17), the bearing (16).
Select a shim (15) from those sold by our Spare Parts Department which will allow the circlips (14) to just enter the groove in the shaft, or with a maximum clearance of 0.04 mm.
Move the synchro into the 2nd speed position.

h) To adjust the front bearing cap (see Pl.43):
Fit a paper joint and tighten the cap (6) on the housing, in order to compress the joint. Remove the bearing cap.
Put a dial gauge on a straight edge (dial gauge 2437-T, straight edge MR-3377, see Pl.13).

Put this assembly on a surface plate. Push the dial gauge point in approximately 7 mm and set the dial gauge to "0". Mark the position of the totalising needle. Example: between 7 and 8.

With the joint in position on the cap, place the straight edge with the dial gauge on the joint, the point of the dial gauge in contact with the face which rests against the bearing.

Bring the needles of the dial gauge to the position they occupied previously (large needle at "0" and totalising needle between 7 and 8) by pulling on the spindles of the dial gauge.

Release the spindle of the dial gauge slowly, counting the numbers of turns and fractions of turns described by the large needle, until the point of the dial gauge spindle rests on the thrust face of the bearing.

Example: the large needle has turned 5.63 turns.

TOOLS

With a micrometer gauge measure the thickness of the shoulder on the bearing, for example 5.48 mm.
Subtract this thickness from the dimension found previously. The difference between the two dimensions represents the thickness of the shims (8) to be placed between the cap and the bearing.
In the example chosen: 5.63 - 5.48 = 0.15 mm.
Do not mix the shims thus determined .... Dial gauge 2437-T
Straight edge MR-3377

28 To prepare the bevel pinion shaft (see Pl.44):

a) Put the driving pins (47) in position in the 2nd speed intermediate pinion (45).

b) Put the 2nd speed intermediate pinion (45) in position on the bevel pinion shaft (23).
Offer up the 3rd and 4th speed intermediate pinion assembly (46) fit as far as possible on the driving pins (47).

IMPORTANT NOTE - If on removal of the bevel pinion shaft the circlip (105) retaining the rollers of the bearing (106) has come out of the groove in the shaft and made a groove on the journals of the 1st speed intermediate loose pinion (107), it is necessary to remove the burrs with abrasive paper or a stone, in effect the journals should be perfectly smooth.

Refit the bearing (108) in the following manner:
Put the rollers (106) in the outer cup of the bearing.
The bevel pinion shaft should be placed in a vertical position while fitting the outer cup and roller assembly of the bearing.
Put the roller retaining circlip (105) in position. (Use circlip pliers in order not to scratch the journals of the 1st speed intermediate loose pinion (107) .... Circlip pliers

NOTE - The bevel pinions sold by our Spare Parts Department are supplied with the bearing fitted.

c) To adjust the setting of the front bearing (19). Carry out the same procedure as in paragraph 27 h.

29 To assemble the intermediate train (see Pl.43):

Place in the box the intermediate train and the 1st speed loose pinion (107), together with its sliding pinion (109).
Put the sliding pinion in the 1st speed position in order to obtain the approximate centering of the intermediate train and of the loose pinion.

30 To assemble the 1st speed fork in the groove of the sliding pinion (see Pl.48).
Position the fork (22) so that the articulating spindle in the lever is towards the front.
Position the lever (98) so that the large boss is towards the casing.
Do not fit the lever pin (21), and swivel the lever towards the rear of the box.

31 To assemble the reverse gear layshaft (see Pl.45):
a) Make sure that the screw (110) is in the spindle (26).
Smear this screw with "Hermetic" when fitting.

TOOLS

28 A To adjust the reverse speed pinion (cars produced since February 1961).

a) (See Pl. 45A, fig. 3). Engage the spindle (26) in the front bearing. Position it so that the hole for the locking screw (25) is located towards the front of the box.

On the spindle (26) fit the needle bearing cage (201), the reverse pinion (202) fitted with the needle bearing cage (203), the locking circlips (204) and the stop MR-4420 (see Pl. 45A, fig. 3 and 6). (Note the order of assembly). Secure the spindle (26) by means of the locking screw (25) ....

Stop MR-4420

b) (See Pl. 44, fig. 1). Remove from the mainshaft prepared in paragraph 27, the circlips (14), the shim (15), the bearing (16), the mainshaft pinion (17), the 2nd speed synchromesh complete (34), the 2nd speed loose pinion (37), the washer (38), the half segments (39), the 3rd speed loose pinion (40), fitted with its needle cage and bronze bush (41).

Fit on the mainshaft (20), the synchromesh (34), complete with drive, adjusting washer (36) and ring.

Place the shaft in the box by inclining it towards the rear, then engage it into the bore for the rear bearing. Put the front bearing (18) into position (see Pl. 43).

Fit on the shaft (20), the mainshaft pinion (17), the bearing (16) (mandrel MR-3045, see Pl. 54, fig. 1), the shim (15) and the circlips (14), tighten the starting handle dog. Fit the cap for the bearing (18) in position together with the adjusting shims determined in paragraph 27 h) ....

Mandrel MR-3045

c) (See Pl. 45A, fig. 2). Place the dial gauge 2437-T fitted with a special contact (contact 2441-T, see Pl. 45A, fig. 5), on a straight edge support (straight edge 1754-T, see Pl. 45A, fig. 7).

Place the straight edge fitted with the dial gauge on the front face of the gearbox casing, the contact resting on the end of the spindle (26). Set the large needle of the dial gauge at "0" and mark the position of the totalising needle. For example: between 2 and 3 ....

Dial gauge 2437-T
Contact 2441-T
Straight edge support 1754-T

TOOLS

d) (See Pl. 45A, fig. 1 and 3). Place the 2nd speed synchro ring (208) against the reverse speed mainshaft pinion (34). Whilst retaining the synchro ring, bring the reverse speed pinion (202) against the 2nd speed synchro ring, place the stop MR-4420 against the pinion (202) and tighten its locking screw.

Slacken the locking screw (25) of the spindle (26) and push on the stop MR-4420 in order to bring the pinion (202) against the needle bearing cage (201). Hold the parts in this position.

Place the straight edge support 1754-T on the front face of the gearbox casing, the contact on the end of the spindle (26). Mark position of the needles,then pull lightly on the assembly of the dial gauge and straight edge support in order to bring the needles to the position that they occupied in inset c).

Count the turns and fractions of turns. For example: j = 3.05 mm.

To this dimension j = 3.05 mm, add 0.30 mm which represents the clearance (a) to be obtained after assembly, between the 2nd synchro ring and the reverse speed pinion. Thus, in the example: 3.05 + 0.30 = 3.35 mm.

e) Select from the thrust washers sold by our Spare Parts Department, a thrust washer (206) of this thickness or one of the next greater thickness (see schedule 1).

In the example given, use the thrust washer 3.46 mm thick (No. DM 333-80d).

f) (See Pl. 45A, fig. 4). Slacken the locking screw of the stop MR-4420. Put the locking circlip (205) in position on the spindle (26). Put the reverse speed pinion spindle (26) in position and tighten the locking screw (25).

Check the setting of the dial gauge (as indicated in inset c)). For example, large needle on "0" and totalising needle between 2 and 3.

Slacken the locking screw (25) of the spindle (26). Using a screwdriver, press the latter towards the front so that the locking circlip (205) presses on the needle bearing cage (201).

Hold the spindle in this position and place the straight edge support fitted with the dial gauge on the front face of the gearbox casing, with the contact touching the end of the spindle (26).

Set the position of the dial gauge needles, for example :
Large needle on 98 - Small needle between 8 and 9.

Let the dial gauge return slowly to its set position (large needle on "0", small needle between 2 and 3), by counting the turns and fractions of turns, for example: 5.98.

From this value, subtract the thickness of the thrust washer determined in inset e). Therefore in the example :

5.98 - 3.46 = 2.52 mm.

From this value, subtract 0.10 mm, which represents the clearance (b) to be obtained after assembly, between the adjusting washer (207) and the locking circlip (205) (see fig. 1). In the example :

2.52 - 0.10 = 2.42 mm.

g) Select from the washers sold by our Spare Parts Department, the adjusting washer (207) of this thickness or one of the next smaller thickness (see schedule II).

In the example, use the adjusting washer 2.20 mm thick (No. DM 333-74f).

IMPORTANT NOTE :

The assembly of the intermediate train (para. 29) and the 1st speed fork (para. 30) are carried out after the assembly of the reverse speed pinion (paragraphs 31A and 31B).

31A To assemble the reverse speed sliding pinion (see Pl. 45A, fig. 3).

a) Remove the locking circlip (205) from the spindle (26). Using a screwdriver, press the spindle towards the front and successively disengage the stop MR-4420, reverse speed sliding pinion (202) and the needle bearing cage (201).

b) Engage the spindle (26) in the front bearing, positioned so that the hole for the locking screw is located towards the front.

Fit successively on the spindle (26), the adjusting washer (206) (the flat located towards the interior of the box), the needle bearing cage (201), (note the direction of assembly), the adjusting washer (207), the reverse speed sliding pinion (202). Fit the locking circlip (205) in position.

Tighten the pointed screw (25) and its locknut (24) (see Pl. 45, fig. 2).

31B a) Remove the cap (6) from the front bearing (18) of the mainshaft, do not mislay the adjusting washers (8). Remove the front bearing (18) (see Pl. 43). Disengage the circlips (14), the shim (15), the rear bearing (16) and the pinion (17) from the mainshaft (see Pl. 44, fig. 1).

TOOLS

b) Fit the 3rd speed loose pinion (40) on the mainshaft, fitted with its needle bearing cage and the bronze bush (41), the locking half segments (39) and the bush (38), the 2nd speed loose pinion (37) fitted with its needle bearing cage and the adjusting shim (36), the 2nd speed synchromesh (34) (see Pl. 44, fig. 1).

IMPORTANT REMARK

Adjustment of the 1st and 2nd speed fork spindle thrust cap.

The adjustment of clearance between the ring (A) controlling the 2nd speed synchro rods and the mainshaft reverse speed pinion (34) is carried out after fitting the gear box on the car and after having connected and adjusted the change speed lever control.

Proceed as follows:

1. *Place the gear selector lever in the 2nd speed position.*
2. *Screw in the thrust cap, situated on the lid in order to make contact with the 1st and 2nd speed spindle (96) (see PL47, fig. 2), without moving the latter.*
3. *Then unsrew the cap [illegible] to [illegible] of a turn, this will represent the clearance (c) to be obtained after assembly, and tighten the locknut (use the spanner MR3691-80, see PL. 57, fig. 2).*

Schedule I

Thrust washers (206)
For the reverse speed needle bearing cage.

Thickness ± 0.01	Spare Part Number
1.54	DM 333-80
2.02	DM 333-80a
2.50	DM 333-80b
2.98	DM 333-80c
3.46	DM 333-80d
3.94	DM 333-80e

Schedule II

Adjusting washers (207)
Between needle bearing cage and locking circlip.

Thickness ± 0.01	Spare Part Number
0.4	DM 333-74
0.7	DM 333-74a
1	DM 333-74b
1.3	DM 333-74c
1.6	DM 333-74d
1.9	DM 333-74e
2.2	DM 333-74f
2.5	DM 333-74g
2.8	DM 333-74h
3.1	DM 333-74i
3.4	DM 333-74j
3.7	DM 333-74k
4	DM 333-74m

		TOOLS
	b) Engage the spindle (26) in the front bearing, position the hole for the spindle locking screw (25) towards the front.	
	c) Fit on the spindle one thrust bearing (28) (the ground face against the pinion), the pinion (111) together with the needles (30), the distance piece (31), the thrust bearing (28) and the sliding pinion (112).	
	d) Measure the end play of the assembly in the casing using a set of feeler gauges. Select, from those sold by our Spare Parts Department, a shim (29) of appropriate thickness in order to obtain a clearance of 0.05 to 0.20 mm. Fit the shim to the front of the pinion between the pinion and the thrust bearing.	
	e) Tighten the pointed screw (25) and its locknut (24)	12 mm box spanner
32	To assemble the mainshaft (see Pl.43):	
	a) Remove from the mainshaft as prepared in paragraph 27 the circlips(14), the shim (15), the bearing (16), the pinion (17). Fit on the mainshaft, the bronze bush (33), the 4th speed loose pinion (42), together with its needle bearing cage. With the cones touching make sure that there is clearance between the 4th speed loose pinion and the bronze bush.	Circlip pliers
	b) Place the assembly in the box by inclining the shaft towards the rear, to fit it first in the bore for the rear bearing.	
	c) Put the bearing (18) in position.	
	d) Put on the shaft (20) the pinion (17) the rear bearing (16) (mandrel MR-3045, see Pl.54, fig.1)	Mandrel MR-3045
33	To assemble the bevel pinion shaft (see Pl.43):	
	a) Engage the bevel pinion shaft (23) in the intermediate train. Put the roller bearing (108) in position in the bore of the casing (mandrel MR-3676-30, see Pl.54, fig.2). Fit an adjusting shim (113), for example 3.7 mm thick, then fit the bearing (19) on the front of the bevel pinion shaft	Mandrel MR-3676-30
	b) Fit the 1st speed lever spindle (21) (see Pl.48). Insert a copper joint	21 mm box spanner
	c) Put 2 gears in mesh and tighten the nut (10) to 144 ft.lbs (20 m.kg). Tighten the starting handle dog to 87 ft.lbs (12 m.kg). Insert a lockwasher (spanner 1734-T, see Pl.54, fig.3) ..	Spanner 1734-T
34	Fit the primary shaft bearing cover plate (6), together with a paper joint smeared with grease, and the adjusting shims (8) determined in paragraph 27 h. Tighten the fixing screws.	
	Put the rear bearing (16) in position (mandrel MR-3045, see Pl.54, fig.1).	
	Fit the adjusting shims (15) and the circlips (14)	14 mm box spanner Mandrel MR-3045 Circlip pliers
35	To adjust the bevel pinion shaft (see Pl.43 and 50).	
	NOTE - This adjustment is of the greatest importance. Giving the teeth the correct bearing will ensure silence and long service from the crown wheel and pinion. The setting dimension is given in millimetres and hundredths of millimetres and is etched on the ground end of the bevel pinion.	

TOOLS

This dimension represents the dimension "l", which should exist when the adjustment is completed between the centreline of the differential shaft and the ground end of the bevel pinion.
This will vary with each crown wheel and pinion.
The adjustment of the bevel pinion setting should be made by using the adjusting fixture 2044-T fitted with the dial guage 2437-T (see Pl.50).
This fixture is constructed so that the distance between the centres of the semi-circular ground bearing faces and the two bearing pads is 55 mm. This number is etched between the two pads.
The measurement should not be taken from the face of the joint of the casing as this differs in relation to the centres of the differential bearings ....

Dial gauge 2437-T
Adjusting fixture 2044-T

a) Fit the lower bearing cover plate (7), together with the adjusting shims (8) determined in paragraph 27 h and a paper joint, without "Hermetic".
Tighten the screws ....

14 mm box spanner

b) Carefully clean the bearing faces for the differential bearings and the semi-circular faces of the adjusting fixture 2044-T. All the faces should be free from scratches or burrs.

c) Put the adjusting fixture on a surface plate resting on the two ground bearing pads. (In this position the pointer on the dial gauge is at 55 mm from the centreline of the ground semi-circular bearing faces.)
Turn the figure "O" on the movable dial on the dial gauge opposite the large needle.
Note the position taken up by the needles on the dial gauge.
Example: totalising needle between 4 and 5; large needle on zero.

d) To measure the actual bevel pinion setting.

1. Put the adjusting fixture in place of the differential. Turn the adjusting fixture by means of the knurled handle until the large needle of the dial gauge changes its direction of rotation.
Mark the information given by the needles of the dial gauge.
Example: totalising needle between 1 and 2; large needle on 82.

2. Bring the needles to the position in which they were in paragraph c (in the example chosen the totalising needle was between 4 and 5; the large needle on zero) by pulling on the dial gauge spindle.

3. Release the spindle of the dial gauge slowly, counting the numbers of turns and fractions of turns described by the large needle, until the point of the dial gauge spindle rests on the ground face of the bevel pinion.
Check that the dial gauge needles have taken up the position indicated in paragraph 1.

Example: the large needle has turned 1.45 turns, that is to say that the difference between the positions when adjusting fixture 2044-T was checked on the surface plate (see paragraph c) and the point of the dial gauge has moved forward 1.45 mm.

The actual bevel pinion setting "l" is: 55.00 + 1.45 = 56.45 mm.

The dimension etched on the ground end of the bevel pinion being for example: 56.70, it is necessary to withdraw the bevel pinion shaft from the centreline of the differential by 56.70 - 56.45 = 0.25 mm.

TOOLS

The adjusting shim being 3.7 mm thick, it will be necessary to replace it by a shim of a thickness: 3.7 - 0.25 = 3.45 mm.
Remove the lower bearing cover plate (7), the nut (10), extract the cage and bearing assembly, replace the shim.
Refit the lower bearing cover plate. The joints should be fitted greased. Insert a spring washer under the head of the screws. Put "Hermetic" under the heads of the screws passing through the casing.
Check the adjustment (fixture 2044-T) ....

14 mm box spanner
Fixture 2044-T

36

a) Put the tubular distance piece (13) on the mainshaft (20) (see Pl.43).

b) Measure the distance "d" between the joint face of the gearbox and clutch bell housing and the rear end of the tubular distance piece (13).

c) Measure the distance "e" between the joint face of the gearbox and clutch bell housing and the face of the sealing joint (11) on the hub of the thrust race (93).

d) Take the difference between the two dimensions (e-d) and choose from those sold by our Spare Parts Department a shim (12) of appropriate thickness to bring this difference to 16.2^{+1}_{0} mm.

e) Fit the sealing joint (11).

37 Fit the speedometer pinion, the bush and the flange. Tighten the fixing screw (spring washer under the head).
Fit the filler and drain plugs (joints under the heads).
Smear with "Hermetic" and fit the steel plug (27) closing the hole for the reverse speed pinion spindle (see Pl.45, fig.2) ....

12 mm box spanner
21 mm spanner

38 To fit and adjust the differential (see Pl.45 and 51).

a) Put the crown wheel and differential assembly together with its bearings in the clutch bell housing.

Connect the clutch bell housing to the gearbox. Smear the face of the joint with *liquid* "Hermetic" or linseed oil. Fit the screws and nuts assembling the casings.

b) To fit the differential shaft and bearing assembly, right side.

Place against the outer bearing race of the differential a distance piece 3.3 mm thick and an adjusting washer 3.2 mm thick, in order to obtain a thickness of 6.5 mm.

The distance pieces and washers are sold by our Spare Parts Department.

c) Remove the gearbox from the stand and let it rest vertically on the clutch bell housing face.

d) Put the dial gauge support 1766-T, together with the dial gauge 2437-T fitted with the extension 2438-T on the left hand housing (see Pl.51, fig.2).
In order to carry out this operation it is necessary for the pressure plate (A) to be totally enclosed in the recess in the support base (B) and the dial gauge should indicate about 10 mm when the extension is in contact with the bearing face (P) of the housing.

Hold the fixture firmly by hand.
Set the dial gauge at "O" and note the position of the needles ....

TOOLS

Support 1766-T
Dial gauge 2437-T
Extension 2438-T

e) To fit the fixture on the gearbox (see Pl.51, fig.1).
Tighten the adjusting screw (C) in order to move the pressure plate (A) forward. Do not alter the setting of the dial gauge. Offer up the fixture on the box. Insert a paper joint. Locate the pin in the splines of the planet wheel.

Fit the fixture. Tighten the adjusting screw (C) to 72 ft.lbs (10 m.kg) and then unscrew it 1/3 of a turn. Tighten the locking screw (D). Pull on the dial gauge spindle in order to put the needles in the position taken in paragraph d . Release the spindle of the dial gauge slowly and count the turns and fractions of turns.
For example a distance 8.2 mm.

f) To measure the clearance between the teeth (see Pl.50).

Fit the dial gauge support on the box (see fig.2). Fit the extension 2439-T on the dial gauge. Then fix the dial gauge on to the support 2039-T, the point of the extension resting perpendicular to the flank of the tooth of the crown wheel, as near as possible to the outside diameter, with the dial gauge reading several millimetres. Take up the clearance between the teeth by moving the differential housing by the right hand brake disc. Check this clearance on four teeth spaced 90° approximately. Take the average of these four readings.

For example: a clearance of 0.62 mm, the clearance between the teeth should be between 0.19 and 0.24 mm, it is necessary to reduce it by 0.38 mm. In order to reduce the clearance between the teeth by 0.1 mm, it is necessary to increase the thickness of the washers by 0.2 mm. In the preceding example, in order to reduce the clearance by 0.38 mm, increase the thickness of the washers (4 and 5) (see Pl.45) fitted between the right hand housing and the outer race of the bearing by:

$$\frac{0.2 \times 0.38}{0.1} = 0.76 \text{ mm}$$

The thickness of the washers needed will be 6.5 + 0.76 = 7.26 mm.

g) In order to obtain the bearing clearance, the total thickness of the washers and distance pieces determined in paragraph e should be 8.2 mm.
The thickness of the shims fitted on the left side:

$$8.2 - 0.76 = 7.44 \text{ mm.}$$

Select from the washers and distance pieces sold by our Spare Parts Department in order to obtain:

On right side: 7.26 mm an adjusting washer (4) of 3.15 mm and a distance piece (5) of 4.10 mm.

On left side: 7.44 mm an adjusting washer (4) of 3.35 mm and a distance piece (5) of 4.10 mm.

Remove the dial gauge.

Remove the adjusting fixture and right hand housing ....

Support for dial gauge 2039-T
Extension 2439-T

TOOLS

39 To fit the shaft and bearing assembly (see Pl.45):

Put the adjusting washers (4) and the distance pieces (5) previously prepared, in their respective positions.

Fit a paper joint on the housing.

Put the housing in position, the oil drain channel towards the bottom (the longer housing fitted on the left side).

Make sure that the distance piece (114) is in position.

Tighten the screws (3) fixing the housing.

Check the clearance between the teeth (see preceding paragraph).

Screw up, without tightening, the screws (1) fixing the brackets (2). Fit on the bracket arms the straight edge 1799-T (see Pl.42) and tighten the screws fixing the straight edge.

Tighten the screws (1) fixing the bracket arms (plain washer under the head) ....

14 mm box spanner
1799-T straight edge

40 With the sliding gears and forks in the neutral position, fit the gearbox cover (insert a paper joint stuck with grease on the cover). Smear the thrust pads of the 3rd and 4th speed selector fork with grease to prevent them falling out of position.

Make sure that the forks are properly engaged in the grooves of the sliding pinions.

Fit the centring screws. Fit the other screws.

41 To adjust the 3rd and 4th selector fork shaft (see Pl.43, 46 and 47):

a) Pull the locking lever (66) so that washer(67)is just in contact with the circlip (65) and swing the support tube (70) towards the front.

The fork is then in the 3rd speed position.

b) Screw the threaded stop screw (75) in order to bring the stop against the selector shaft. Then unscrew the screw one eighth of a turn and tighten the locknut (76) (spanner MR-3691-80, see Pl.57, fig.2) ....

Spanner MR-3691-80
21 mm ring spanner

c) Carry out the same procedure for the 4th speed position after having swung the support tube (70) towards the rear.

NOTE - This operation is no longer necessary on cars produced since January 1960.

		TOOLS
	REMOVAL	
1	Remove the spare wheel, the spare wheel support, the front wings, the air deflector panel and the brake cooling duct. Remove the battery and the battery tray. Remove the battery bracket and withdraw it towards the front	8-12-14 mm box spanners
2	Remove the steering assembly (see Op.ID.100-1, paragraph 9)	
3	Remove the radiator and the brake unit (see Op.ID.451-1).	
4	Jack up the front of the car (jacking bracket 2505-T, see Pl.111). Remove the front wheels. Remove the drive shaft dust shields from the sidemembers. Remove the clip securing the drive shaft dust shield and remove the dust shield from the flexible coupling (Bibax)	Jacking bracket 2505-T 8 mm box spanner
5	Remove the front axle arms from the pivot (extractor and pressure pad 1864-T, see Pl.64, fig.3). Remove the rubber cups and the nylon cups from the pivot sockets	26 mm box spanner Extractor and pressure pad 1864-T
6	Disconnect the steering rod from the pivot lever (extractor 1964-T and pressure pad 1968-T, see Pl.64. fig.2). Remove the rubber cup and the nylon cup from the lever socket	21 mm box spanner Extractor 1964-T Pressure pad 1968-T
7	Remove the closing panels under the brake discs. Drain the gearbox	21 mm box spanner
8	Turn up the locking pieces and remove the fixing screws on the front crossmember of the gearbox support. Remove the screws securing the support on the gearbox	14 mm spanner and ring or spanner 2126-VA 14 mm box spanner
9	Pull back the support arm towards the brake disc and remove the four gearbox driving plate bearing fixing screws	12 mm spanner
10	Remove the flexible coupling (Bibax), the brake disc and the support arm and bearing assembly from beneath the vehicle	
	IMPORTANT NOTE - Do not mislay the adjusting washer (4) and the differential bearing distance piece (5) (see Pl 45)	
	NOTE - If necessary, disconnect the Bibax from the brake disc before removing the assembly on the right hand side.	
11	Disconnect the flexible coupling (Bibax) from the brake disc.	
12	Strip the bearing of the gearbox driving plate (see Op.ID.330-3, paragraph 18a).	

REFITTING (see Pl.45)

		TOOLS
13	Assemble the gearbox driving plate bearing (see Op.ID.330-3, paragraphs 25 and 26c).	
14	Place the distance piece (4) and the differential bearing adjusting washer (5) in position.	
15.	Place the flexible coupling, brake disc, support arm and gearbox driving plate bearing in position (the outlet pipe directed downwards). Insert the paper gasket, affixing it to the bearing with grease. Tighten the 4 fixing screws (3) of the gearbox drive plate bearing	12 mm spanner
16	Insert, without tightening, the screws (1) securing the support arm on the gearbox (plain washers under the screw heads).	
17	Tighten the fixing screws securing the support arm on the front crossmember. Turn down the locking pieces. Tighten the fixing screws securing the support arm to the gearbox	14 mm box spanner 14 mm spanner and ring or spanner 2126-VA
18	Connect the flexible coupling to the brake disc if these parts were disconnected (right hand side). Place the brake disc locating screws in their bores on the flexible coupling. Tighten the fixing screws	12 mm box spanner
19	Place the drive in position in the gearbox drive plate slide.	
20	Carefully remove the grease from the cones of the front axle arms and from the pivot sockets. Connect the front axle arms to the pivot sockets. Insert the nylon cups and the rubber cups. Tighten the nuts and lock with split pins	26 mm box spanner
21	Remove the grease from the cones of the steering rod and from the socket on the pivot lever. Connect the steering rod to the pivot lever. Insert the nylon cup and the rubber clip. Tighten the nut and lock with a split pin	21 mm box spanner
22	Place the drive shaft dust shield on the flexible coupling. Fit a Ligarex clip (pliers 2483-T, see Pl.17, fig.2). Fit the drive shaft dust shields on the sidemembers. Tighten the screws (plain and spring washers under the heads)	Pliers 2483-T 8 mm box spanner
23	Fit the brake unit and the radiator (see Op.ID.451-1).	
24	Fit the steering assembly (see Op.ID.100-1, paragraph 42).	
25	Place the battery bracket in position. Tighten the fixing screws (plain and spring washers under heads). Insert the distance piece between the battery bracket and the front engine support crossmember. Fit the battery tray. Fit and connect the battery	12 mm spanner and box spanner

		TOOLS
26	Fit the front wheels. Lower the car to the ground (jacking bracket 2505-T, see Pl.111). Tighten the wheel fixing screws to 108-144 ft.lbs (15-20 m.kg)	Jacking bracket 2505-T
27	Fill the gearbox: 3.6 pints (2 litres SAE 90 EP oil).	
28	Fit the brake cooling duct, the air deflector panel, the front wings, the spare wheel support and the spare wheel	8-12-14 mm box spanners
29	Fill the radiator, with the engine running.	

PARTICULAR POINTS.

Assembly

14 *Adjust the selector fork shaft of the 1st, 2nd and reverse speeds: engage the gear, bring the threaded plug into contact with the shaft, then unscrew 1/4 of a turn and lock the locknut.*

18 *With the cover fitted, adjust the selector fork shaft of the 3rd and 4th speed: engage the gear, bring the threaded plug into contact with the shaft, the latter should not move, then unscrew 1/8 of a turn and lock the locknut.*

23 *Adjust the heights of the brake units: the linings should stand slightly proud of the discs at the front by approximately 1 mm.*

		TOOLS
	REMOVAL	
1	Remove the spare wheel and the air deflector panel. Remove the battery and the battery tray	12 mm box spanner
2	Drain the radiator and retain the liquid which contains anti-freeze mixture.	
3	Remove the radiator (see Op.ID 232-1).	
4	Disconnect the gear selector control from the box cover (see Op. 334-1, paragraphs 5 to 10).	
5	Disconnect the earth lead from the gearbox cover (1st model)	14 mm box spanner
6	Support the engine and gearbox assembly using a covered chain round the water pump cover (chain sling 1697-T, see Pl. 42)	Chain sling 1697-T
7	Remove the clip securing the exhaust down pipe to its bracket. Remove the fixing screws securing the exhaust down pipe bracket to the gearbox support (lower section)	12-14 mm box spanners
8	Remove the lower adjusting nuts of the front support rods (6) of the brake units (see Pl.99)	21 mm spanner and box spanner
9	Remove the screws securing the gearbox support brackets to the crossmember (lower part)	14 mm box spanner
10	Remove the screws securing the crossmember (upper part) to the sidemember. Disengage the crossmembers, retaining the adjusting shims found between crossmember and sidemembers	14 mm box spanner
11	Remove the adjusting nuts of the front brake connecting cable (1) and remove the cable (see Pl.99)	12 mm spanner and box spanner

		TOOLS
12	Remove the fixing nuts of the support for the rubber end thrust block. Remove the block and support assembly	14 mm box spanner
13	Make sure that the gear selector control is in the neutral position. Remove the gearbox cover fixing screws and studs. Start lifting the cover vertically from the gearbox; remove the slide blocks from the selector forks of the 3rd and 4th gears in order to prevent them from falling off. Remove the cover and gasket	14 mm box spanner
	REFITTING	
14	Adjust the threaded plugs of the selector fork shafts of the 1st, 2nd and reverse gears (see Pl.47). Place the shaft (96) in the 1st speed position, screw the threaded sleeve (75) to bring it into contact with the shaft, the latter must not move, unscrew the threaded sleeve $\frac{1}{4}$ of a turn and lock the locknut (76) (spanner MR-3691-80, see Pl.57, fig.2). Proceed in the same way for the 2nd speed position and for the reverse shaft (101) IMPORTANT NOTE : 1. *Cars delivered before January 1960* - Shaft (99) of the 3rd and 4th gears is adjusted when the cover is fitted on the gearbox. 2. *Cars delivered since January 1959* - This adjustment is no longer necessary.	Spanner MR-3691-80 21 mm spanner
15	Make sure that the sliding gears are in the neutral position. Place the selector fork shafts in the neutral position. Stick the gearbox cover gasket to the cover, using grease for this purpose. Also stick the selector slide blocks of the 3rd and 4th speeds, in position, with grease.	
16	Put the cover in position on the gearbox. Make sure that the forks engage correctly in the sliding gears and that the 1st gear control lever is engaged in the 1st and 2nd gear selector fork shaft.	
17	Secure the cover to the gearbox by means of two locating screws then by means of the other screws and studs	14 mm box spanner
18	To adjust the 3rd and 4th gear selector fork shaft (see Pl.46 and 47) (*Cars delivered before January 1960*):	
	a) Pull the locking lever (66) the flange (7) which bears on the ring (65) and turn the support tube (70) to the front. The fork is then in the 3rd gear position.	
	b) Screw up the threaded sleeve (75) until it is in contact with the shaft, without moving the latter. Then unscrew the sleeve 1/8 of a turn and tighten the locknut (76) (spanner MR-3691-80, see Pl.57, fig.2)	Spanner MR-3691-80 21 mm ring spanner
	c) Proceed in the same way for the 4th gear position after having turned the support tube (70) towards the rear	

		TOOLS
19	Fit the rubber end thrust block and support assembly. Tighten the nuts (spring washers)	14 mm box spanner
20	Fit the front brake connecting cable (1) (see Pl. 99).	
21	Place the crossmember on the support brackets of the gearbox.	
	Fit the front support rods (6) on the brake unit sockets and fit the lower nuts on the rods (see Pl. 99).	
	Secure the crossmember (lower part) to the gearbox support brackets. Tighten the screws and turn down the locking pieces	14 mm box spanner
22	Lower the engine and gearbox assembly until the upper part of the crossmember rests on the sidemembers. The shims found when dismantling should be placed in position between the crossmember and the sidemembers. Tighten the crossmember fixing screws (plain and spring washers under the heads)	14 mm box spanner
23	To adjust the height of the brake units: work on the retaining nuts of the front socket supports of the brake units so that the linings stand proud slightly at the front (about 1 mm) (see Pl. 99). Adjust the front brake connecting cable (see Op. ID 454-0).	21 mm spanner and box spanner
24	Connect the gear selector control to the gearbox cover and adjust (see Op. ID 334-1, paragraphs 14 to 20).	
25	Fit the radiator :	
	a) Fit the radiator in place, insert the rubber blocks between the radiator and the front crossmember bracket of the gearbox.	
	b) Connect the upper flexible hose to the radiator and the lower flexible hose to the steel pipe.	
	c) Place the exhaust downpipe bracket in position and insert the plain washer and the distance piece between the left-hand arm of the bracket and the radiator fixing bracket.	
	d) Insert the radiator fixing screws and the exhaust pipe bracket fixing screws without tightening them (plain and spring washers under the heads).	
	e) Fit the clip securing the exhaust pipe to its bracket. Tighten the nuts (spring washers). Centre the radiator; the fan blades must not touch the cowling. Tighten the radiator fixing screws and the exhaust pipe bracket fixing screws.	
	f) Place the upper and lower flexible hose clips in position and tighten.	
	g) Fit the radiator tie-bar on the cowling and on the water pump (plain and spring washers under the head of the screw and under the nut	12-14 mm box spanners
26	Fit the air deflector panel. Tighten the fixing screws (plain and spring washers under the heads).	
	Fit the battery tray. Fit and connect the battery. Connect the battery earth cable to the gearbox cover	12-14 mm box spanners
27	Fill the radiator with the engine running.	

PARTICULAR POINTS.

6 *Adjust the lateral clearance of the levers controlling the selector shafts (mandrel 1793-T, see Pl.56).*

Fit the mandrel (A), the distance pieces, the levers (take care with the positioning) the circlip. Measure the clearance of the assembly of parts in the gearbox cover and use a shim which will give a clearance of 0·15 to 0·25 mm.

10 *Calibrate the locking lever spring: length = 52 mm under a load of 29 + 1·5 kg.*

12 *Adjust the levers controlling the selector shafts.*

Engage the gear, bring the threaded sleeve into contact with the shaft, then unscrew 1/4 of a turn. Tighten the locknut.

Important. – The shaft of the 3rd and 4th speed is adjusted when the cover is fitted on the gearbox.

		TOOLS
	DISMANTLING (see Pl. 46-47).	
1	Remove the circlip (65) locking the locking lever (66). Remove the locking lever. Remove the cup (67) and the spring (68) of the locking lever (spring compressor 1792-T, see Pl. 57, fig. 4)	Spring compressor 1792-T
2	Remove the circlip (69) from the support tube (70). Remove the support tube (do not lose the locking balls). Remove the ring seal (71) from the tube (70).	
3	Remove the screws (72), the springs (73), the balls (74) locking the fork shafts. Remove the threaded sleeves (75) and their locknuts (76) (spanner MR-3691-80, see Pl. 57, fig. 2)	17-21 mm box spanners Spanner MR-3691-80
4	Unscrew the fork locking screws, disengage the fork shaft, the forks, the catch (80), and the locking plugs (81)	9 mm spanner
5	Remove the adjusting shim (77), the distance pieces (78) and (82), the levers (79, 94 and 95) from the fork control lever shaft. Remove the sealing cap (83).	
	ASSEMBLY (see Pl. 46, 47 and 56).	
6	To adjust the lateral clearance of the levers controlling the selector shafts (mandrels 1793-T, see Pl. 56, fig. 1 and 5):	
	a) Fit the mandrel (A) from the right-hand side of the gearbox cover. Fit the reverse speed control lever (94) (see Pl. 46, for position of the levers), fit a distance piece (82), the 3rd and 4th speed control lever (95), a distance piece (82), the 1st and 2nd speed control lever (79), the distance piece (78) and the circlip (69)	Mandrel 1793-T

		TOOLS
	b) With a set of feeler gauges, measure the distance "b" between the thrust face on the gearbox cover and the circlip (69).	
	c) Select a shim of appropriate thickness, sold by our Spare Parts Department, in order to obtain a clearance of 0.15 to 0.25 mm.	
	d) Remove the circlip (69) the shim (77) and the distance piece (78).	
7	To fit the forks:	
	a) Engage the locking plugs (81), the 1st and 2nd speed fork shaft (96), fit the fork (97) on the shaft. Put the control lever (79) in position in the groove of the shaft (96).	
	b) Fit the 3rd and 4th speed fork shaft (99), fit the catch (80), fit the fork (100) on the shaft (99). Put the control lever (95) in position in the groove of the shaft (99). Tighten the screw fixing the fork.	
	c) With the shafts (96) and (99) in the neutral position, push the reverse gear shaft (101) towards the rear of the cover. Engage the fork (102) on the shaft and put the lever (94) in position in the groove of the shaft.	
	d) Tighten the screws fixing the forks (97) and (102). Lock the screws with iron wire, fitted in such a way to avoid any rotation in the direction of unscrewing	9 mm spanner
8	Fit the locking balls (74), the springs (73) and the screws (72) (copper joint under the head)	17 mm spanner and box spanner
9	Fit the distance piece (78) and the shim (77) on the mandrel (A) (see Pl.56, fig.3). Fit the ring seal (71) on the support tube (70) and fit the mandrel (B) in the support tube. Put 18 balls (103) in the tube (70), greased to keep them in position (see Pl.56, fig.3). The shafts of the forks being in the neutral position, engage the assembly of the mandrel (B) and the tube (70) in the cover of the gearbox, pushing the mandrel (A) at the same time with the tube (70) (see Pl.56, fig.3). Fit the circlip (69) in the groove of the tube (70), between the distance piece (78) and the shim (77)	Mandrel 1793-T
10	Check the calibration of the locking lever spring (68): under a load of 29 ± 1.5 kg. the length should be 52 mm. (fixture for calibrating springs 2420-T, see Pl.6)	Fixture 2420-T
11	Fit the spring (68) and the cup (67) on the locking lever (66) (spring compressor 1792-T, see Pl.57, fig.4). Engage the locking lever in the support tube (70) and with the latter push out the mandrel (B) (see Pl.56, fig.4). Fit the circlip (65) retaining the locking lever. Fit the sealing cap (83) with "Hermetic".	Spring compressor 1792-T
12	To adjust the shafts controlling the forks (see Pl.47):	
	a) Screw in for a few threads, the threaded sleeves (75) of the fork shafts, together with the locknuts (76).	

	TOOLS
b) Put the shaft (96) in the 1st speed position. Screw in the threaded sleeve in order to bring it against the shaft, unscrew the sleeve $\frac{1}{4}$ of a turn and lock the locknut (spanner MR-3691-80, see Pl.57, fig.2)	Spanner MR-3691-80 21 mm spanner
c) Carry out the same operation for the 2nd speed position (shaft 96) and for the reverse speed shaft (101).	
IMPORTANT NOTE - (*Cars delivered before January 1960*). The shaft (99) of the 3rd and 4th speed is adjusted when the cover is mounted on the gearbox. Make sure that the slide blocks of the 3rd and 4th speed are in position when fitting the cover on the gearbox.	

PARTICULAR POINTS.

1 *To adjust the control tube:*

This tube must be accurately seated in the centre of the support tube of the selector fork shaft levers.

2 *To adjust the ball controls:*

In the neutral position the dimension "a" should be 17·5 ± 0·5 mm between the centre of the rear end piece of the cable and the rear face of the selector tube.

3 *To adjust the control rod:*

In the neutral position the dimension "b" should be 39·5 mm between the underside of the instrument panel cover and the underside of the selector lever knob.

	ADJUSTMENT.	TOOLS
1	To adjust the control tube (see Pl. 59 and 60) : This tube must be accurately seated in the centre of the support tube (5) of the selector fork shaft levers.	
	a) Disconnect the end piece (14) of the gear selector control rod (2) from the lever (11).	
	b) Slacken the fixing nuts of the bearing (4) and move the bearing in the slots (34) in order to obtain the correct height; the bearing (4) is provided with horizontal slots enabling it to be moved backwards and forwards	12 mm spanner and box spanner
	c) Tighten the fixing nuts of the bearing (4).	
2	To adjust the ball controls (see Pl. 59 and 60) : Screw up the sleeve (12) until a measurement of "a" = 17.5 ± 0.5 mm is obtained at the selector, the support tube (5) of the selector fork shaft control levers being in the "neutral position". Tighten the locknut (13)	17-21 mm spanners
3	To adjust the change speed selector control rod (see Pl. 59 and 60) :	
	a) Place the selector lever at a height such that the distance "b" = 39.3 mm. Keep it in this position.	
	b) Move the end piece (14) of the control rod (2) so that the bore in the socket is exactly opposite the hole in the lever (11) on the control tube.	
	c) Fit the coupling pin (22) and tighten the nut (spring washer).	
4	To adjust the selector lever (see Pl. 59 and 60) :	
	a) Remove the cover of the instrument panel and make sure that the lever is in the neutral position.	
	b) Make sure that there is a distance "a" = 17.5 mm between the centre of the pin (15) and the rear face of the gear control shaft (32); if not, adjust the ball control (see paragraph 2, this operation).	
	c) Check that there is a measurement of "b" = 39.5 between the underside of the instrumentpanel cover and the under side of the knob of the selector lever (35); if not, adjust the control (see paragraph 3, this operation).	
	d) Make sure that the selector operates properly. Fit the instrument panel cover and tighten the fixing screws (cup washers under the heads).	

PARTICULAR POINTS

Replacement of a ball control.

19 *To adjust the ball control: in the neutral position the dimension "a" should be 17.5 ± 0·5 mm between the centre of the pin and the rear face of the selector tube.*

To adjust the control rod: in the neutral position the dimension "b" should be 39·5 mm between the underside of the instument panel and the underside of the selector lever knob.

		TOOLS
	REPLACEMENT OF A BALL CONTROL	
	Removal (see Pl. 59 and 60).	
1	Remove the instrument panel cover.	
2	Remove the split pin from the cable coupling clevis pin (15). Remove the clevis pin (15).	
3	Unlock the locknut (13) of the threaded sleeve (12) and completely unscrew the threaded sleeve (12)	17-21 mm spanners
4	Remove the spare wheel and the air deflection panel	12 mm box spanner
5	Disconnect the connecting tube (1) from the control tube (5) on the gearbox cover (do not mislay the rubber gasket (6) and the two distance washers (10). Disconnect the connecting tube (1) from the bracket on the sidemember	12 mm spanner and box spanner
6	Disconnect the end piece (14) of the control rod (2) from the lever (11) of the connecting tube	12 mm spanner
7	Unscrew the fixing collars from the suspension reservoir. Pull the selector cable towards the front. Lift the suspension reservoir and withdraw the connecting tube (1) towards the front.	
8	Disengage the circlip (9) retaining the key (8) and remove the key (8). Remove the pin coupling the cable (3) to the locking lever (16) (do not mislay the locking ring of the locking lever).	
9	Remove the coupling flange (7) from the sheath end piece and remove the connecting tube (1).	
10	Remove the speedometer cable from the cable guide (17) on the sidemember. Unscrew the cable guide fixing screw. Remove the cable guide (17) from the sidemember	12 mm box spanner
11	Withdraw the cable and guide assembly towards the front. Remove the guide from the cable by withdrawing it towards the front. Remove the plain washer (18) and the serrated washer (19) from the threaded sleeve (12).	

		TOOLS
	Refitting (see Pl. 59 and 60).	
12	Fit a sealing ring (20) on the sheath end piece on the gearbox cover side.	
13	Fit the cable guide (17) on the cable from the front end. (Make sure that it is fitted properly, the part of the tube projecting beyond the plate must be at the front). Place the plain washer (18) and the serrated washer (19) on the threaded sleeve (12).	
	Place the cable and support assembly in position from the front of the car. Engage the rod of the cable (3) in the selector. Place the guide (17) in position and tighten the fixing screw.	
	Put the speedometer cable in position in the cable guide (17) and turn down the clips on the speedometer cable	12 mm box spanner
14	With the control tube (5) on the gearbox cover in the neutral position, place the seal (6) on the tube (5) and fit the pin coupling shaft of the cable (3) to the locking lever (16).	
15	Bring the coupling flange (7) against the cover of the gearbox. Hold the flange (7) in position and pull on the sheath of cable (3) in order to fit the key (8). Fit the key (8) and fit the key retaining circlip (9).	
16	Raise the suspension reservoir and put the connecting tube (1) in position. Insert the distance washers (10) between the connecting tube (1) and the flange (7). Tighten the fixing screws on gearbox cover side (spring washers under heads)	12 mm box spanners
17	Secure the connecting tube (1) on the bracket (34) on the sidemember. The connecting tube (1) must be positioned accurately in the centre of the control tube (5) on the gearbox cover. Tighten the collars securing the suspension reservoir	12 mm spanner and box spanner
18	Connect the cable (3) to the selector lever and fit the coupling pin.	
19	To adjust the cable (see Pl. 59) :	
	a) Screw up the threaded sleeve until a distance "a" = 17.5 ± 0.5 mm is obtained at the selector lever. Tighten the locknut (13)	17-21 mm spanners
	b) Place the selector lever at a height so that the distance "b" = 39.5 mm.	
	c) Unscrew the locknut (21) of the end piece (14) of the control rod (2) and shift this end piece until the hole is exactly opposite the hole in the lever (11) on the connecting tube.	
	d) Fit the coupling pin (22) and tighten the nut (insert a spring washer).	
	e) Make sure that the distance "b" has not been altered. Check the operation of the selector lever	12 mm spanner
20	Refit the cover of the instrument panel. Tighten the fixing screws (cup washers under the heads).	
21	Refit the air deflection panel and the spare wheel	12 mm box spanner

REPLACEMENT OF THE BALLS OF THE SELECTOR BELL-CRANK LEVER

		TOOLS
	Removal (see Pl. 59 and 60).	
22	Remove the coil (cars produced before January 1958).	
23	Remove the pin from the cup (23) of the upper ball (24) and remove the cup (spanner MR-3691-60, see Pl. 61, fig. 4).	Spanner MR-3691-60
24	Hold the stem of the lower ball (25) and with an 8 mm drill destroy the riveted joint in the lower ball (at "c"). Unscrew the upper ball (24)	8 mm drill
25	Remove the pin from the cup (26) of the lower ball (25). Remove the cup and ball.	
26	Disconnect the control rod (2) from the bell crank lever (27).	
27	Remove the pin from the fulcrum (28) of the ball crank lever (27). Remove the washers and the lever (27). Remove the hollow fulcrum (29) from the bell crank lever.	
	Refitting (see Pl. 59 and 60).	
	NOTE - After any dismantling work the two balls must be renewed.	
28	Fit the hollow fulcrum (29) on the bell crank lever (27). Fit the lever, the washers and the pin.	
29	Fit the lower ball (25) and screw on the upper ball (24) on the stem of the lower ball.	
30	Using a screw clamp (screw clamp 2472-T, see Pl. 61, fig. 2), rivet the stem of the lower ball (25) on the upper ball (24)	Screw clamp 2472-T
31	Grease the balls (adhesive grease). Fit the cups (26) and (23) of the lower and upper balls (25) and (24) (spanner MR-3691-60, see Pl. 61, fig. 4). Tighten moderately, check the operation of the balls. Fit the pins	Spanner MR-3691-60
32	Connect the control rod (2) to the bell crank lever (27). Tighten the nut (insert a spring washer).	
33	Fit and connect the coil (cars produced before January 1958).	

TOOLS

REPLACEMENT OF A SELECTOR SUPPORT OR A CONTROL SHAFT

Removal (see Pl. 59).

34 Remove the steering column (see Op. ID 441-1).

35 Remove the lighting and horn switch, hold the latter when undoing the fixing nuts .... 7 mm box spanner

36 Remove the glove compartment, the central plate of the instrument panel, the upper ledge and the lower panel (remove the heating control lever ball).

Remove the lower rim of the instrument panel and the left-hand ventilation grill .... 8 mm box spanner

37 Disconnect the cable from the speedometer. Remove the speedometer.

38 Remove the clevis pin (15) connecting the cable rod (3) to the selector. Unscrew the locknut (13) and unscrew the control rod threaded adjusting sleeve (12). Withdraw the ball control towards the front .... 17-21 mm spanners

39 Remove the fixing screws and nuts of the selector support (30).

Disconnect the air pipe of the right-hand demister from the hot air distribution pipe.

Begin to release the support (30) from the instrument panel; disconnect the speedometer cable towards the front and disengage the support completely .... 8 mm box spanner

40 To strip the support (see Pl. 59 and 91).

a) Remove the sealing plate (6), the felt washer (7), the inner bearing cup (8), the balls and the nylon spacers. Do not allow the balls to scatter.

b) Remove the rubber bush (31) and the control shaft assembly (32) by tapping lightly on the rubber bush on the control shaft side, with a drift.

c) Remove the control shaft (32) and the half bearings (33) from the rubber block (31).

To fit (see Pl. 59).

41 To re-assemble the support (see Pl. 59 and 91) :

a) Place the half bearings (33) and the selector control shaft (32) on the rubber bush (31).

b) Place the rubber bush (31) complete with control shaft (32) on the support (30). Oil the front end of the control shaft.

		TOOLS
	c) In the rubber bush (31) fit the outer bearing cup (9), the balls, the nylon spacers and the inner bearing cup (8). Fit the felt washer (7) after first greasing it. Also grease the bearings (bearing grease). Fit the plate (6) and tighten the fixing screws.	
42	Fit the complete support on the car. Engage the speedometer cable and the rear end of the ball control (3) in the support; finish fitting the support. Tighten the fixing screws and nuts (plain and spring washers under the heads of the screws and under the nuts)	8 mm box spanner
43	Connect the ball control (3) to the selector lever. Fit the clevis pin and split pin (15).	
44	To adjust the ball control (see Pl. 59 and 60): Screw the threaded sleeve (12) until a distance "a" = 17.5 ± 0.5 mm is obtained between the rear end of the control shaft (32) and the centre of the clevis pin (15).	
45	Place the selector lever at a height such that the distance "b" is equal to 39.5 mm. Connect the gear selector control rod (2) to the selector bell crank lever (27). Make sure that the distance "b" has not changed	14 mm spanner
46	Connect the air pipe of the left-hand demister to the hot air distribution pipe.	
47	Fit the speedometer. Tighten the fixing nuts (plain and spring washers)	8 mm box spanner
48	Fit the left-hand ventilation grill. Tighten the fixing screws (plain washers under the heads)	8 mm box spanner
49	Fit the instrument panel, lower rim, the lower plate, the upper shelf and the central instrument panel (cup washers under the heads of the screws). Place the rubber stop of the glove box under the head of the upper fixing screw of the central plate. Fit the glove box.	
50	Fit the steering wheel column (see Op. ID 441-1).	
51	Fit the lighting and horn switch. Tighten the fixing nuts moderately (plain washers). Fit the instrument panel cove	8 mm box spanner
52	Check the selector for proper operation and the selector control lever for clearance. If necessary, correct the adjustment made in accordance with paragraphs 44 and 45.	

REPLACEMENT OF A DRIVESHAFT OR A PIVOT

		TOOLS
	Removal (see Pl.62).	
1	Put the front of the car on stands (jacking bracket 2505-T, see Pl.111). Remove the spare wheel, the wing and the front wheel. Release the pressure in the suspension system	Jacking bracket 2505-T 8 mm spanner 12-14 mm spanners and box spanners
2	Remove the dust cover (13) from its support on the flexible coupling (Bibax) (see Pl.79).	
3	Disconnect the steering relay rod from the steering lever (1) on the pivot (extractor 1964-T and pressure pad 1968-T, see Pl.64, fig.2). Remove the rubber and nylon cups from the ball joint	21 mm box spanner Extractor 1964-T Pressure pad 1968-T
4	Disconnect the axle arms from the pivot ball joints (extractor and pressure pad 1864-T, see Pl.64, fig.3). Remove the rubber cups (7) and the nylon cups (8). Remove the pivot and driveshaft assembly	26 mm box spanner Extractor and pressure pad 1864-T
5	To disconnect the driveshaft from the pivot:	
	a) Place the pivot and driveshaft assembly in a vice (vice support 1922-T, see Pl.6, fig.1). Drill out the centre punch marks locking the screw (9) and the ring nut (10) fixing the driveshaft (drill 2 mm dia.). Remove the locking screw (9) and the greaser	Vice support 1922-T 8 mm spanner
	b) Unrivet the half shells fixing the dust cover (11). Remove the dust cover towards the splined drive coupling.	
	c) Using a screwdriver, disengage the seal (12) from the groove in the hub of the pivot.	
	d) Hold the driveshaft vertically and fit the spanner 1920-T on the nut (10) (see Pl.66, fig.2). Unscrew the nut (10) (this nut is tightened to 288 ft.lbs (40 m.kg). Remove the spanner and remove the driveshaft assembly and the nut (10) from the pivot. Remove the seal (12) from the driveshaft. Remove the spring (14) and the cone (13)	Spanner 1920-T
	Refitting (see Pl.62 and 79).	
6	To connect the driveshaft to the pivot:	
	a) Place the pivot in a vice (vice support 1922-T, see Pl.66, fig.1)	Vice support 1922-T
	b) Put the wheel locking cone (13) in position (the dowel engaged in one of the slots of the hub) and put the spring (14) in position.	
	c) Offer up the driveshaft in the hub of the pivot, the driving dowels opposite the holes of the driving plate and the hole for the locking screw (9) lined up with the tapped hole in the hub.	
	d) Engage the dowels in their housing by striking on the end of the driveshaft. Tighten the nut (10) to 288 ft.lbs. (40 m.kg) (spanner 1920-T, see Pl.66, fig.2). Tighten the screw (9) locking the nut (10) and lock with two centre punch marks	Spanner 1920-T

		TOOLS
7	Fit the seal (12), squeeze the seal by hand, incline the splined end of the shaft and work the seal over the splines. Do not damage the interior threads of the seal by rubbing on the splines. Engage the lip of the seal in the groove of the hub, using a rod with a rounded end in order not to damage the seal. Put the seal in position by working round the bore of the hub with the rod.	
8	Put the driveshaft dust cover (11) in position on the double universal joint (taper fitting 1930-T, see Pl.68). Position the half shells, draw the edges of the half shells together using pliers and rivet them. Fit the greaser	8 mm spanner
9	Fit the dust cover (13) in position on the gearbox end of the driveshaft (taper fitting 1930-T, see Pl.68)	Taper fitting 1930-T
10	Offer up the driveshaft and pivot assembly on the car. Clean the tapers of the ball joint and the arms. Engage the driveshaft in the splined drive coupling (Bibax) previously greased (bearing grease). Connect the axle arm ball joints, fitting the nylon cup (8) and the rubber cup (7). Tighten the nuts and fit a split pin	26 mm box spanner
11	Fit the dust cover on the gearbox side and fit the clips.	
12	Connect the steering lever ball pin on the pivot to the steering relay rod. Fit a nylon cup and a rubber cup. Tighten the nut and fit a split pin	21 mm box spanner
13	Fit the wing and the spare wheel. Fit the wheel and lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg). Put the system under pressure	8 mm spanner 12-14 mm spanners and box spanners
14	Check the alignment and the steering lock (see Op.ID 440-0).	

REPLACEMENT OF A RUBBER DUST COVER (gearbox end)

		TOOLS
	Removal (see Pl.62 and 79).	
15	Remove the driveshaft and pivot assembly (see paragraphs 1 to 4 this operation).	
16	Place the driveshaft and pivot assembly in a vice (vice support 1922-T, see Pl.66, fig.1).	
	Remove the clip fixing the dust cover (13) on the driveshaft and remove the dust cover	Vice support 1922-T
	Refitting (see Pl.62 and 79).	
17	Fit the dust cover (13) on the driveshaft (taper fitting 1930-T, see Pl.68)	Taper fitting 1930-T
18	Fit the driveshaft and pivot assembly, on the car (see paragraphs 10 to 13 this operation).	

TOOLS

REPLACEMENT OF A RUBBER DUST COVER (pivot end)

Removal (see Pl.62)

19 Remove the driveshaft and pivot assembly (see paragraphs 1 to 4 this operation).

20 Place the driveshaft and pivot assembly in a vice (vice support 1922-T, see Pl.66 fig.1).
Unrivet the half shells (15) fixing the dust covers (11). Remove the dust cover .... Vice support 1922-T

Refitting (see Pl.62).

21 Remove the clip fixing the dust cover (13) and disengage towards the double coupling.

22 Put the taper fitting 1930-T (see Pl.68) on the driveshaft. Slide the dust cover (11) on the previously greased taper fitting and engage on the driveshaft .... Taper fitting 1930-T

23 Pull the dust cover (11) over the dust cover (13), (see Pl.79) and fit in position on the double universal joint. Put the half shells (15) in position and draw the edges of the shells together using pliers and rivet them.

24 Fit the driveshaft and pivot assembly on the car (see paragraphs 10 to 13 this operation).

PARTICULAR POINTS.

Checking the valve of the suspension pump for leakage (bench test).

2 *Under a pressure of 2133 p.s.i. (150 kg/cm²), the needle of the pressure gauge should remain stationary.*

Pressure control valve bench test.

Checking the cutting out of the control valve.

5 *Raise the pressure until the fluid spurts from the return to the reservoir aperture. At this precise moment, read the pressure which should be 1849 p.s.i. to 1991 p.s.i. (130 to 140 kg/cm²).*

Checking for leakage.

6 *After the valve has cut-out, there should be no fall in pressure.*

Checking the cutting-in of the control valve.

7 *Slightly unscrew the bleed screw of the control valve, in order to lower the pressure to 1564 p.s.i. (110 kg/cm²), and then tighten the bleed screw.*

Operate the pump, if there is any flow of fluid, the valve has not cut-in.

Repeat the operation under a pressure of 1493 p.s.i. (105 kg/cm²). If there is no flow of fluid and the needle of the pressure gauge begins to rise between 1493 p.s.i. and 1564 p.s.i. (105 to 110 kg/cm²) the control valve has cut in; if not repeat the operation under a pressure of 1422 p.s.i. (100 kg/cm²). The cut-in should be between 1422 p.s.i. and 1564 p.s.i. (100 to 110 kg/cm²).

Checking the initial pressure of an accumulator on suspension sphere.

11 *Connect the threaded union on the accumulator from a 0 to 1422 p.s.i. (100 kg/cm²) pressure gauge. Operate the pump, the pressure rises rapidly, then stabilises at a pressure which is the initial pressure, which should be 924 p.s.i. $^{+71}_{-213}$ p.s.i. (65 $^{+5}_{-15}$ kg/cm² at 20° C.). For a front suspension sphere this pressure should be 838 $^{+28.5}_{-213}$ p.s.i. (59 $^{+2}_{-15}$ kg/cm²), while for a rear suspension sphere it should be 369 $^{+28.5}_{-142}$ p.s.i. (26 $^{+2}_{-10}$ kg/cm²).*

Checking a pressure control valve on the car.

Checking the cutting-out of the control valve.

14 *Start the engine and tighten the bleed screw; check the reading of the pressure gauge at the moment when the valve cuts-out; this should be between 1849 p.s.i. and 1991 p.s.i. (130 to 140 kg/cm²).*

Checking the cutting-in of the control valve.

16 *With the engine idling, slightly loosen the bleed screw, at the moment when the valve cuts in the needle remains steady then rises. The pressure when the valve cuts-in (pressure shown at the moment when the needle changes direction) should be between 1422 p.s.i. and 1564 p.s.i. (100 and 110 kg/cm²).*

CHECKING THE VALVE OF THE SUSPENSION PUMP FOR LEAKAGE (see Pl. 128).

In order to carry out his operation the test bench should be prepared as shown in Pl. 126 (test bench 2290-T) . . .

1 Connect the pump aperture "c" to the test bench orifice "a" using the pipe (S).

2 Tighten the bleed screw "b" and operate the pump to raise the pressure to 2133 p. s. i. (150 kg/cm²).

a) Check the needle on the pressure gauge; it must remain stationary or return towards zero only very slowly and almost imperceptibly.

TOOLS
Test bench 2290-T

TOOLS

b) There should be no leakage of liquid between the end cap (1) and the pump body unless the gasket (4) or the bearing face of the gasket on the seating (6) or on the cap are defective or if the thickness of the washer (5) is not correct (washer too thick) (see Pl. 84).

c) If the pressure does not rise or if the needle of the pressure gauge returns quickly to the zero reading, undo the bleed screw (b) in order to bleed the system. Retighten the bleed screw and operate the pump; any impurities under the valve will be removed by the movement of the fluid.

Repeat this operation three or four times; if the needle of the pressure gauge does not remain stationary the valve is defective.

3 Undo the bleed screw "b". Remove the pump.

PRESSURE CONTROL VALVE BENCH TEST (See Pl. 129).

Checking the cutting-out of the control valve.

To carry out this operation, close the orifice of the test bench pump by means of the plug (V) .... Test bench 2290-T

4 Fit a plug (L) in the place of the accumulator, inserting a washer.

Connect the inlet aperture "d" of the pressure control valve to the aperture "a" of the test bench pump by means of the pipe (S). Connect the outlet aperture of the pressure control valve to the pressure gauge (M3), using the pipe (J).

5 Make sure that the bleed screw "b" is tight; operate the pump to raise the pressure until the valve cuts out. At this moment the liquid "spurts" from the return-to-reservoir aperture and the lever of the pump can be operated without effort.

Read the maximum pressure of the cut-out valve at this very moment. Immediately afterwards the needle of the pressure gauge (M3) starts to move back to "0".

The needle of the pressure gauge (M3) must indicate a maximum pressure of between 1849 p.s.i. and 1991 p.s.i. (130 and 140 kg/cm^2).

If the valve is defective, the pressure indicated by the pressure gauge (M3) is not stable, the fluid flows out of aperture "f" and the lever is hard to operate.

NOTE - If the pressure recorded is less than the limits given and there is no leakage (see following paragraph), the number of washers must be increased or decreased (9) (see Pl. 85, fig. 1).

If it is impossible to effect a cut-out, and it is found that the fluid is flowing out of the return-to-reservoir aperture "f", the cut-out valve is defective.

Checking for leakage.

6 After the valve has cut-out, read the recording on the pressure gauge (M3): there must be no change of position, if there is, the cut-out valve is defective. It is necessary to re-seat the balls.

Checking the cutting-in of the control valve.

7 After a cut-out has been obtained, slightly undo the bleed screw (g) of the control valve in order to lower the pressure indicated by the pressure gauge (M3) to 1564 p.s.i. (110 kg/cm^2). Retighten the bleed screw "g" and operate the pump; if there is any flow of liquid, no cut-in has been effected.

Repeat this operation for a pressure of 1493 p.s.i. (105 kg/cm^2).

Operate the pump. If there is no flow through the return-to-reservoir aperture "f" and the pressure rises on the pressure gauge (M2) and (M3), cut-in has been effected for a pressure between 1493 p.s.i. and 1564 p.s.i. (105 and 110 kg/cm^2).

If there has been no successful cut-in, repeat the procedure at a pressure of 1422 p.s.i. (100 kg/cm^2).

Cut-in must occur between 1422 p.s.i. and 1564 p.s.i. (100 and 110 kg/cm^2).

NOTE

1. If the cut-in pressure is outside the limits given above, the number of washers (9) must be increased or reduced (see Pl. 85, fig. 1).
2. This check can also be carried out on the car.

8 Release the pressure by unscrewing the bleed screw "b" of the test bench pump and the bleed screw "g" of the control valve. Remove the pipes (S) and (J) and the plug (L).

CHECKING THE INITIAL PRESSURE OF AN ACCUMULATOR OR SUSPENSION SPHERE (see Pl. 132).

For this operation the test bench must be prepared as shown in Pl. 125 .... Test bench 2290-T

9 Remove the accumulator.

10 Screw on the union (K). Insert a seal. Note the number engraved on the plug of the accumulator. This number indicates the pressure 924 p.s.i. (65 kg/cm^2). Connect the union (K) to the aperture "a" of the pump using pipe (H).

11 Tighten the bleed screw "b". Operate the pump to raise the pressure. Note the pressure gauge needle. The pressure at first does not seem to rise and then rises rapidly, and remains steady at the pressure of the accumulator.

NOTE - At a temperature of 68°F (20°C) this pressure must be equal to 924 ± 70 p.s.i. (65^{+5}_{-15} kg/cm^2). The pressure of a front suspension sphere must be $838^{+28.5}_{-213}$ p.s.i. (59^{+2}_{-15} kg/cm^2), while the pressure of a rear suspension sphere must be $369^{+28.5}_{-142}$ p.s.i. (26^{+2}_{-10} kg/cm^2).

12 Release the pressure by unscrewing the bleed screw "b".
Remove the pipe (H) and the union (K).

TOOLS

CHECKING A PRESSURE CONTROL VALVE (on the car) (see Pl.133)

For this operation the test bench must be prepared as shown in Pl.126 (test bench 2290-T) .... Test bench 2290-T

13 Release the pressure by unscrewing the bleed screw "g" of the pressure control valve.

Disconnect the pipe between the pressure control valve and the connecting pipe to the distribution block from the connecting pipe and connect the end of this pipe to the pressure gauge (M2) using pipes (A and B) .... 8 mm spanner
Spanner 2219-T or 2221-T

14 Start the engine and tighten the bleed screw "g".

Read the pressure on the pressure gauge (M2) at the moment cut-out occurs (needle of the pressure gauge (M2) remains stationary).

This pressure must lie between 1849 p.s.i. and 1991 p.s.i. (130 and 140 kg/cm^2).

Checking for leakage

15 Watch the needle of the pressure gauge (M2). If the cut-in valve is seating correctly there should be no drop in the pressure.

Checking the cutting in of the control valve.

16 With the engine idling unscrew the bleed screw "g" of the pressure control valve *very slightly* in order to reduce the pressure very slowly.

Watch the pressure gauge needle: at the moment the valve cuts-in the needle seems to become steady and then moves upwards. The cut-in pressure (pressure shown at the moment the needle changes direction) must lie between 1422 p.s.i. and 1564 p.s.i. (100 and 110 kg/cm^2).

NOTE - If it fails to cut in or does so only with difficulty and if there is no internal leak (see paragraph 15), the number of shims (1) must be reduced or increased (see Pl.85, fig.2) in order to obtain the correct clearance "a".

17 Switch off the engine and allow the pressure to fall by undoing the bleed screw "g" of the pressure control valve.

Remove the pipes (A and B) and connect the pipe between the pressure control valve and the connecting pipe to the distribution block to the connecting pipe.

Tighten the bleed screw "g" . ... 8 mm spanner

TOOLS

ADJUSTING THE POSITION OF THE SUSPENSION PUMP

This operation must be carried out if an engine or crankcase has been replaced (*see Pl.20*).

18 Remove the air filter and the rocker cover ....

12-17 mm box spanners

19 Turn the crankshaft so that the valves on the 4th cylinder are rocking, i.e. inlet valve beginning to open and exhaust valve almost closing

20 Mount a dial test indicator fitted with probe (A) on the bar (B). Place the bar fitted with the dial test indicator on the bush (C) (use setting fixture 1693-T fitted with a dial test indicator 2437-T, see Pl.20, fig.1) and place this assembly on a surface plate.

Load the dial test indicator (6 mm approximately) and set the zero mark on the movable dial opposite the big pointer Note the position of the small pointer (totalising needle) e.g. between 3 and 4 ....

Setting fixture 1693-T
Dial gauge 2437-T

21 Place the bar fitted with the dial gauge on the face of the crankcase which receives the pump (see fig.2).

Facing the engine *turn it clockwise* until the pointer of the dial gauge changes its direction of rotation

NOTE - If the engine is rotated by more than a quarter of a turn in either direction, the eccentric would damage the dial gauge.

22 Return the pointers to the position they had in paragraph 3 (in the example chosen: small pointer between 3 and 4, big pointer opposite zero) by pulling on the probe of the dial gauge.

Release slowly the probe of the dial gauge and count the number of turns and fractions of a turn revolved by the large pointer, until the moment when the tip rests on the high pressure pump operating cam.

Example: the big pointer revolved 4.42 turns.

23 The dimension "a" to be obtained between the pump mounting face and the operating cam is 40 ± 0.1 mm (see fig.3), the bush (C) being at a height of 22 mm.

The paper gaskets (2) between the pump and the spacer and between the crankcase and the spacer, when compressed, have an average thickness of 0.17 mm.

24 It will therefore be necessary to place, between the pump mounting face and the respective face on the crankcase, a spacer having a thickness "b" = 40 mm. minus the thickness of the paper gaskets (0.17 x 2 = 0.34 mm), the dimension measured in paragraph 5 (4.42 mm) and the height of the bush (C) (22 mm).

In the example selected, "b" = 40 - (0.34 + 4.42 + 22) = 40 - 26.76 = 13.24 mm

TOOLS

25 Select from those sold by our Spare Parts Department, the spacer whose thickness "c" is closest to the dimension "b" found above.

Table of spacers:

c ± 0.03	No.	c ± 0.03	No.
14.05	DM 391-90	13.49	DM 391-90 d
13.91	DM 391-90 a	13.35	DM 391-90 e
13.77	DM 391-90 b	13.21	DM 391-90 f
13.63	DM 391-90 c	13.07	DM 391-90 g

In the example selected above, the spacer No. DM 391-90 f would have to be fitted.

OPERATION No. ID 391-1 : *Replacement of suspension pump*

		TOOLS
	REMOVAL (see Pl.20)	
1	Release the pressure by unscrewing the bleed screw of the pressure regulator. Retighten the bleed screw	8 mm spanner
2	Slightly unscrew the union on the control valve from the connecting pipe between pump and control valve and unscrew fully the union on the high pressure pump (spanner 2220-T, see Pl.61, fig.3)	Spanner 2220-T
3	Remove the pump fixing screws. Withdraw the pump complete with the distance piece (1) and the paper gaskets (2) and disconnect from the pump, the pipe connecting the control valve to the pump	12 mm box spanner and 12 mm ring spanner
4	Remove the inlet pipe clamps and disconnect the pipe from the pump and from the reservoir	
5	Remove the distance piece (1) complete with dowels (3) from the pump and remove the paper gaskets (2) between pump and distance piece.	
	ASSEMBLY (see Pl.20)	
6	On either side of the distance piece (1) place a paper gasket (2), first dipping the latter into boiled linseed oil, and fit this assembly on the high pressure pump.	
7	Fit the pump and these accessories on the bearing face of the crankcase.	
	Insert the pump fixing screws without tightening them (spring washers under the heads)	
	Connect to the pump the connecting pipe between control valve and pump (spanner 2220-T, or 14 mm. spanner, see Pl.61, fig.3).	
	Tighten the pump fixing screws and tighten the unions of the pipe connecting the pump to the control valve	12 mm box spanner and 12 mm ring spanner Spanner 2220-T 14 mm spanner
8	Connect the inlet pipe to the pump. Fit the clamp and tighten.	
	At the point where the clamp fits round the pipe insert a rubber ring in order to prevent fracture of the pipe.	
9	Fill the pump with fluid through the inlet pipe.	
	Connect the inlet pipe to the outlet pipe. Fit a rubber ring on the pipe and tighten the clamp.	
10	Unscrew the bleed screw of the control valve.	
	Start the engine and allow it to run for several minutes. Tighten the bleed screw. Place the system under pressure.	
	Check the unions for leakage. Make sure that the accumulator is under pressure	8 mm spanner

PARTICULAR POINTS.

7 *Avoid turning the cap on the pump body in order to position the orifices (risk of damaging the joints).*

8 *Before starting the engine, it is necessary to fill the pump with fluid through the feed pipe.*

TOOLS

OVERHAULING A SUSPENSION PUMP (*Cars produced before February 1960*).

Dismantling (see Pl. 84).

1 Disconnect the roller and plunger assembly.
Hold the pump in a vice, tighten moderately.
Remove the end cap (1). Disconnect the valve spring (2), the valve (3), the end cap seal (4) and the shim (5) ....

12 mm box spanner

2 Remove the pump from the vice. Place it vertically on a bronze drift inserted in place of the plunger. Press on the pump body and hold the parts in the upper section in order to prevent their dispersion when the cylinder casing is removed ....

Bronze drift dia. = 20 mm
Length = 100 mm

Withdraw the piston (8) from the cylinder. Remove the seal (10) from the groove in the cylinder. Remove the spring (11). Remove the circlip (12) and the spring cup (13).

3 Clean the parts in trichlorethylene and dry them in a jet of compressed air.

Assembly (see Pl. 84).

4 If the seat of the valve is only lightly scored, grind it by rubbing it on abrasive paper No. 600 moistened with alcohol; this abrasive paper should be placed on a surface plate. (It is advisable to renew the seat (6) in all cases). Clean with alcohol and dry in a jet of compressed air.
If the valve is badly scored it must be renewed.

Check the seating of the seal (4) on the seating and on the body; the bearing of the seal (7) on the cylinder and the bearing of the cylinder seal (10) in the body. . There should not by any scratches.

If the spring (11) is found to be broken, it must be withdrawn carefully in order to avoid scratching the body.

IMPORTANT NOTE - If any of the following parts have to be replaced: end cap (1), seat (6), cylinder bracket (9) or pump body, the thickness of the shim (5) to be placed between the end cap and the body must be determined. This is done as follows :-

5 To determine the thickness of the shim (5) :

In the body of the pump fit the cylinder bracket, the seating (*without seal*) and the end cap (*without seal*). Keep the parts in position by pressing on the end cap. With feeler gauges measure the clearance between the end cap and the body. Measure this distance at three different points and take the average of the three readings,

TOOLS

for example 0.20 mm. Since the clearance must be between 0.05 and 0.09 mm the thickness of the washer must be 0.20 - 0.09 = 0.11 mm.

Select a washer of the thickness determined above or one of the next greatest thickness. In this example the latter would be 0.15 mm. *There must always be a clearance* (before tightening) between the end cap and the body. Dismantle the parts.

6 To prepare the parts :

Place the spring cup (13) and then the circlip (12) on the stem of the piston. Clean the cylinder and the piston with alcohol. Dry in a jet of compressed air and carefully wipe the piston and the bore of the cylinder with a clean soft cloth.

Impurities present can cause scoring which may lead to a leakage of the suspension fluid into the engine. First smear the seal (10) with suspension fluid or even better with castor oil and place it in position in the groove in the cylinder (cone 2227-T, see Pl. 89, fig. 13).

NOTE - The ring seals (7) and (10) are almost of the same size. They can be distinguished by placing them one on top of the other; the ring seal with the smaller outside diameter is the ring seal (10). This ring seal is also harder (krylene) than the ring seal (7).

Smear the piston and the cylinder bore with suspension fluid. Fit the spring (11) and insert the piston in the cylinder.
Make sure that it slides easily in the cylinder and that the circlip is in position in the spring cup.
Smear seal (7) with suspension fluid and insert it in the groove in the seating. The seal must be fitted on the outer diameter of the groove and there must be a certain amount of clearance on the inner diameter .... Cone 2227-T

7 To fit the pump :

Place the end cap on the raised blocks so that the end cap is level. Place on the end cap the shim (5) determined in paragraph 5, the ring seal (4) smeared with suspension fluid, the spring (2) (see illustration for location) and the valve (3). Compress the spring (2) by pressing with the finger on the valve (3) until the valve penetrates into the bore of the end cap. Slide the seating bracket (6) on the valve until it is centred on the end cap (the seating (6) is fitted with the ring seal (7) located towards the top). Position the piston-cylinder assembly on the seating and centre it. While holding the seating and pressing on the end cap, offer up the body of the pump on the assembly of the parts (see fig. 2 for positioning of the holes). Through the bore for the plunger, push on the end of the piston (8) so as to retain the valve in position, then put the body on the different parts, pressing firmly. Be careful not to damage the sealing ring (4) when sliding on the body. The body should seat on the shim (5), if not, the valve is not in position, the parts have wedged, the operation must be started over again.

Hold the assembly by hand and tighten the screw to $12\frac{1}{2}$ to $13\frac{3}{4}$ ft.lbs (1.7 to 1.9 m.kg) .... 12 mm socket torsion spanner

IMPORTANT NOTE - On no account must the end cap or body be twisted to obtain the correct location of the inlet and outlet holes. This can cause damage to the seals and can cause leakage.

8 Put the roller and plunger assembly, previously oiled (SAE 20 engine oil) in the bore of the pump body.

Check that the assembly slides easily when pressing on the roller.

NOTE - When exchanging the return spring (11) the above operations must be carried out except paragraph 5 (determination of the thickness of the shim).
In this case use the shim found when dismantling. The ring seals and the valve must be renewed everytime of re-assembly.
Check very carefully that the seating of the cylinder in the body has not been damaged by the end of the coils of spring.

NOTE - Before running, in order to prime the pump, it is absolutely necessary to refill with fluid through the inlet pipe.

OVERHAULING A SUSPENSION PUMP (*Cars produced since February 1960*).

Dismantling (see Pl. 84 A).

9 Remove the roller and tappet assembly.

10 Hold the pump in a vice and tighten moderately. Remove cover (1), release the valve spring (2), the valve (3), the cover seal (4), the shim or shims (5) for setting the cover ....

12 mm box spanner

11 Remove the pump from the vice. Insert a brass rod in place of the tappet and hold the pump vertically; push the body of the pump downwards, and hold the parts at the top to prevent them from scattering when the sleeve is released.
Withdraw the piston (8) from the sleeve. Remove the seal (10) from the groove in the sleeve. Remove the spring (11), the circlip (12) and the spring cap (13) ....

20 mm dia. brass rod
Length = 100 mm

12 Remove the intermediate piston (14) from the pump body, by means of a brass rod.
If the intermediate piston must be replaced, the pump body will also need replacing ....

7 mm dia. brass rod
Length = 150 mm

13 Clean the parts in alcohol. Dry by compressed air. Ensure that holes (a) and (b) are not blocked.

Assembly (see Pl. 84 A).

14 If the valve seat is slightly scratched, rub it against a No. 600 abrasive paper moistened in alcohol; the paper should be rested on a surface plate. (It is recommended that the seat (6) should be replaced in all cases). Clean in alcohol and dry by means of a jet of compressed air.

The valve must be replaced if it is scored.

15 Check the seating of the seal (4) on the seat and in the pump body, the seating of the seal (7) on the sleeve and the seating of the sleeve seal (10) in the pump body. There must be no scratches.

16 If the spring (11) is found to be broken, it should be removed very carefully to avoid scoring the pump body.

TOOLS

IMPORTANT NOTE - If one of the following parts has been replaced :- cover (1), seat (6), sleeve (9) or pump body, the thickness of the shim (5) to be placed between the cover and the body must be determined. Proceed in the following manner :-

17 To determine the thickness of the shim (5) :

a) Insert in the pump, the sleeve (9), the seat (6) and the cover (1) *(without seals)*.
Retain the parts by pushing on the cover by hand.

b) Using feeler gauges, measure the clearance between the cover and the body. This should be measured at three different points; calculate the average of the three readings, e.g.: 0.20 mm.

c) In view of the fact that the clearance should be between 0.05 and 0.09 mm, the thickness of the shim will be: 0.20 - 0.09 = 0.11 mm.

Select from those sold by our Spare Parts Department, the shim which corresponds to the thickness determined or the next largest thickness. *There must always be a clearance* (before tightening) between the cover and the body.

d) Remove the parts from the pump body.

18 Prepare the parts :

a) Place the spring cap (13) and then the circlip (12), on the stem of the piston. Clean the piston and the sleeve with alcohol. Dry with compressed air and carefully clean the piston and the bore of the sleeve, by means of a soft rag; in fact, dirt could form scratches, causing leakage of suspension fluid into the engine.

b) Place the seal (10) in position (after smearing it with suspension fluid, or better still, with castor oil) in the groove in the sleeve (cone 2227-T, see Pl. 89, fig. 13) .... Cone 2227-T

NOTE - Seals (7) and (10) are almost the same size. To identify them, place one over the other; the seal with the smallest external diameter is the seal (10). This seal is also more hard (krylene) than seal (7).

c) Smear the piston and the sleeve bore with suspension fluid. Fit the spring (11) and insert the piston in the sleeve. Ensure that it slides satisfactorily and that the circlip (12) is in position inside the spring cap (13).

d) Smear the seal (7) with suspension fluid, and fit it in the groove of the seat (6). This seal must be tight on the outer diameter of the groove, but must have a certain clearance on the inside diameter.

19 Assembling the pump :

a) Place the cover (1) on two vee blocks so that it is vertical. Place the shim (5) determined in paragraph 9, on the cover, followed by the seal (4) smeared with suspension fluid, the spring (2) (see fig. 1 for positioning) and the valve (3).

b) Compress the spring (2) by pressing down on valve (3) with one finger until the valve enters the bore in the cover.

c) Slide the seat (6) over the valve until it is concentric with the cover. Place the sleeve-piston assembly on the seat and centre it.

TOOLS

d) While continuing to maintain the seat on the cover, place the pump body on the assembly of parts (see fig. 2 for the positioning of the holes). Insert a brass rod through the bore which receives the tappet, and press on the end of the piston (8) to hold the valve in position; then insert the body over the different parts by pushing down firmly.

Take care not to damage the seal (4) when the body is finally inserted ....

7 mm dia. brass rod
Length = 150 mm

e) The body must seat against the shim (5). If it does not, the valve is not in the correct position and the operation must be repeated.

f) Hold the assembly by hand and tighten the screws fixing the cover to a torsion of 12.325 to 13.775 ft.lbs. (1.7 to 1.9 m.kg) (torsion spanner 2471-T, see Pl. 7, fig. 2) ....

Torsion spanner
2471-T
12 mm socket

IMPORTANT NOTE - Avoid twisting the cover or the body to obtain the correct positioning of the inlet and outlet ports, as this could damage the seals and cause leakage.

g) Insert the intermediate piston (14) after smearing it with suspension fluid, in the body of the pump.

NOTE - In the case of very light scratches, the piston may be lightly lapped against No. 600 abrasive paper moistened in alcohol. However, it is preferable to replace the pump body and intermediate piston assembly.

12 Oil the tappet and roller assembly (SAE 20 engine oil) and insert it in the pump bore after ensuring that holes (a) and (b) are not blocked. Check that the assembly slides satisfactorily by pushing the tappet.

REPLACEMENT OF A PRESSURE REGULATOR.

		TOOLS
	Removal.	
1	Release the pressure by unscrewing the bleed screw of the pressure regulator	8 mm spanner
2	Remove the petrol pump, withdraw it towards the front and disconnect the flexible inlet pipe	14 mm box spanner
3	Disconnect the suspension feed pipe from the union of the connecting pipe to the distribution block (spanner 2219-T or 2221-T, see Pl. 61, fig. 3)	Spanner 2219-T or 2221-T
4	On the suspension pump slightly unscrew the union from the connecting pipe to pump and pressure regulator (spanner 2220-T or 14 mm spanner, see Pl. 61, fig. 3)	Spanner 2220-T or 14 mm spanner
5	Remove the pressure regulator upper fixing screw	12 mm spanner
6	Raise the car and support the front of the car (jacking bracket 2505-T, see Pl. 111)	Jacking bracket 2505-T
7	Disconnect the control valve and pump connecting pipe from the pressure regulator (spanner 2220-T or 14 mm spanner). Remove the retaining collar from the pressure regulator	Spanner 2220-T or 14 mm spanner
8	Remove the clamp from the rubber return pipe to reservoir. Disconnect the pipe from the control valve and close the aperture of the pipe with a plug (see Pl. 89) and remove the pressure control valve and accumulator assembly.	
9	Disconnect the suspension feed pipe from the pressure regulator (spanner 2221-T or 2219-T)	Spanner 2221-T or 2219-T
	Assembly.	
10	Fit the retaining clip on the pressure regulator and connect the suspension feed pipe (spanner 2221-T or 2219-T)	Spanner 2221-T or 2219-T
11	Place the pressure regulator in position, connect the control valve and pump connecting pipe to the pressure regulator and tighten the union on the suspension pump (spanner 2220-T or 14 mm spanner)	Spanner 2220-T or 14 mm spanner
12	Connect the suspension feed pipe to the union of the connecting pipe of the distribution block (spanner 2221-T or 2219-T)	Spanner 2221-T or 2219-T
13	Insert and tighten the upper fixing screw of the pressure regulator (spring and plain washer under the head). Tighten the pressure regulator clip	12 mm spanner and box spanner
14	Connect the rubber return pipe to reservoir to the pressure regulator. Tighten the clip inserting a rubber ring to avoid fracture of the pipe.	

		TOOLS
15	Fit the petrol pump, tighten the nuts (insert a spring washer). Connect the flexible inlet pipe	14 mm box spanner
16	Unscrew the pressure regulator bleed screw.	
	Start up the engine and allow it to run for several minutes.	
	Retighten the bleed screw. Place the system under pressure.	
	Check the unions for leakage. Check the level of the liquid in the reservoir, top up if necessary.	8 mm spanner
	REPLACEMENT OF AN ACCUMULATOR OR OF A GASKET BETWEEN THE ACCUMULATOR AND THE PRESSURE REGULATOR.	
	Removal	
17	Release the pressure by unscrewing the bleed screw of the pressure regulator	8 mm spanner
18	Remove the pressure regulator and accumulator assembly (see this operation, paragraphs 2 to 8).	
19	Disconnect the accumulator from the pressure regulator (strap wrench 2223-T, see Pl.87, fig.1). Close the openings in the pressure regulator and in the accumulator (see Pl.89)	Strap wrench 2223-T
	Assembly	
20	Connect the accumulator to the pressure regulator and insert the gasket. Screw the accumulator on to the pressure regulator by hand.	
21	Fit the pressure regulator and accumulator assembly on to the car (see paragraphs 10 to 16 of this operation).	

		TOOLS
	DISMANTLING (see Pl.85)	
1	Disconnect the accumulator (strap wrench 2223-T, see Pl.87, fig.1)	Strap wrench 2223-T
2	Disengage the piston (2). Remove the retaining plate (3) of the valve ball (4). Do *not* mislay the shim or shims (1) found under the plate. Withdraw the ball.	
3	Remove the bleed-screw (5) and remove the ball (6).	
4	Remove the cap (7). Screw the retaining spindle (A) in the threaded bore provided for the union of the connecting pipe. Hold the regulator immobile, if necessary by means of an extension on the spindle (A), braced against the frame of the press.	
	Fit the spanner (B) on the cap and keep it in position with the aid of the press (the cap is tightened to 72 ft.lbs (10 m.kg). Undo the cap Considerable force is exerted on the latter by the spring (8). Compensate this thrust by using the press. While unscrewing the cap ease off the press in order to avoid any strain on the thread (the spanner and spindle assembly is sold under No. 2224-T, see Pl.87, fig.2).	
	NOTE - This measure is essential to avoid stripping the last few threads. Remove the adjusting washers (9), the spring (8) and the thrust cup (10)	Spanner and spindle 2224-T
5	Remove the cap seal (11), the accumulator gasket, the ring seal (12) from the bleed screw and the ring seal (13) from the piston.	
6	Clean the parts in alcohol. Dry in a jet of compressed air.	
	ASSEMBLY (see Pl.85)	
7	To prepare the body of the control valve.	
	1. To remake the seating for the ball (4) on the non-return valve seat. a) Place the body upright on a wooden board. Place a ball that is *in good condition* on the seat.	
	b) Make a good seat by tapping on the ball with a hammer and a drift. Remove the ball. This must not be re-used.	Drift 5 mm dia. x 60 mm long
	2. To remake the seating for the ball (6) on the seat "c" of the bleed screw: Place a ball that is in good condition on the seat. Make a seating by *lightly* tapping on the ball with a hammer and a drift. Remove the ball. This must not be re-used	Drift 10 mm dia. x 120 mm long
	3. With a small scraper remove any burrs round the hole provided for the fixing screw of the plate (3).	

TOOLS

8 Fit a ring seal (13) after first being smeared with fluid, on the piston (2) (cone 2226-T, see Pl.89, fig.12).

Immerse the piston in the fluid and fit it in the cylinder. Make sure that the piston slides freely in the cylinder ..... Cone 2226-T

9 Place a new ball (4) on the valve seat.

Determine the number of adjusting shims (1) to be placed under the plate (3). Make sure that the face "d" of the body of the control valve is free from burrs or dents.

Place in position a straight-edge MR-3377 (see Pl.13, fig.3) together with a dial gauge on which the pointer has been replaced by the extension 2438-T (see Pl.51, fig.2) so that the straight-edge rests on the face "d" and the extension is in contact with the ball (4). Use the straight-edge and gauge only on the dry parts (ball and seat). Set the dial gauge at zero.

Note the position of the totalising needle.

Place the straight-edge so that the extension is at the point of contact between the bearing face "e" of the shim (1) on the body of the control valve. Take the difference between the two readings, for example a projection of the body with respect to the ball of 0.1 mm. Knowing that the clearance "a" must be between 0.3 and 0.4 mm a shim (1) 0.20 mm thick, must therefore be fitted. To make sure that this shim still enables the plate (3) to be fitted in the proper position proceed as follows:

Mark the position of the edge of the seat "b" with respect to the bearing face "e" of the washers on the body. Place the straight-edge on the control valve, with the extension in contact with the bearing face "e" of the shim (1). Set the dial gauge at zero. Place the straight edge so that the extension is in contact with the edge of the seat "b". Take the difference between this and the previous reading. In the case of the above mentioned example the seat must project more than 0.20 mm beyond the body, if not the plate will not be parallel with the body. Use a shim (1) of another thickness in order to remain within the limits of tolerance (clearance "a" between 0.3 and 0.4 mm).

Place the shim (1) and the plate (3) in position and tighten the screw .... Dial gauge 2437-T
Straight-edge MR-3377
Extension 2438-T

10 Check the tightening torsion of the nut (14) of the cylinder, 21.6 ft.lbs (3 m.kg) .... 24 mm socket extension
Torsion spanner 2471-T

11 Place the thrust cup (10) complete with ball in the body of the control valve. Make sure that the piston is sufficiently withdrawn to enable the ball to fit on its seat.

NOTE - The cup must not be fitted undrilled.

Place the seal (11) in the body of the regulator. Fit the spring (8).

Place the adjusting washer (9) in the cap. Holding the regulator with the pin (A) as shown in paragraph 4, place the spanner (B) in position on the cap.

Using a press, compensate the thrust of the spring and engage the first threads of the cap on the control valve without forcing. Screw up and follow the cap with the press (spanner and spindle 2224-T, see Pl.87, fig.2).

If the force exerted by the press is correct, the nut will rotate easily.

		TOOLS
	VERY IMPORTANT - The thread of the cap must be carefully cleaned and all traces of aluminium dust must be removed. Smear liberally with *castor oil* - do not use any other product.	
	If removal of the cap is essential for making an adjustment, the above cleaning and greasing measures must be carried out every time	Spanner and drift 2224-T
12	Place a ring seal (12) on the bleed screw (5). (Use cone 2225-T, see Pl.89, fig.11). Insert a new ball and tighten the screw moderately	Cone 2225-T
13	Place a gasket on the accumulator. Fit the accumulator (tighten by hand).	
14	Bench test the regulator (see Op.ID 391-0).	

TOOLS

REPLACEMENT OF THE OVERFLOW RETURN PIPES OF THE HEIGHT CORRECTORS

Removal

1 Jack up the left hand side of the car (jacking bracket 2505-T, see Pl.111) .... Jacking bracket 2505-T

2 Release the pressure in the system by undoing the pressure regulator bleed screw.
Put the height control lever in the low position .... 8 mm spanner

3 Remove the spare wheel, the wings and the front and rear left hand wheels and the side protection plates of the height correctors .... 8-12-14 mm spanners and box spanners

4 Remove the closing panel under the left hand brake disc.

5 On the lower part of the left hand front sidemember remove the rubber collars securing the corrector overflow return pipes to the control valve return-to-reservoir pipe and disengage the corrector overflow return pipes from the clips on the sidemember.

6 Disconnect the rubber union for the corrector overflow return pipes from the suspension reservoir. Seal the reservoir outlet pipe and the rubber union.

7 To remove the front corrector overflow return pipe:

a) Remove the rubber collar securing the overflow return pipe to the front suspension feed pipe.

b) Disconnect the overflow return pipe from the corrector and from the union to the reservoir. Seal the apertures of the pipe and of the corrector (see Pl.89).

c) Withdraw the pipe from underneath the car.

8 To remove the rear corrector overflow return pipe:

a) Remove the lower closing panels from the left hand sidemember.

b) Remove the rubber collars securing the overflow return pipe to the rear suspension pipes under the sidemember and remove the collar securing it to the rear brake feed pipe at the front end of the sidemember.

c) Disconnect the overflow return pipe from the rubber union of the reservoir and rear corrector. Seal the apertures of the pipe and corrector (see Pl.89).

d) Withdraw the front end of the overflow return pipe from the side of the car and the rear section through the opening at the front of the sidemember.

TOOLS

Refitting

9 To fit the front corrector overflow return pipe:

a) Place the pipe in position and connect it to the rubber union of the reservoir and of the corrector.

b) Fit the rubber collar securing the overflow return pipe to the front suspension feed pipe.

10 To fit the rear corrector overflow return pipe:

a) Insert the overflow return pipe from the front of the left hand sidemember and pass it through the pipe brackets on the sidemember. Fit the rubber collars securing the overflow return pipe to the rear suspension pipes under the sidemember.

b) Connect the overflow return pipe to the rear corrector.

c) Fit the collar securing the overflow return pipe to the rear brake feed pipe at the front end of the sidemember.

d) Insert the front section of the overflow return pipe inside the front sidemember next to the rubber suspension return pipe.

e) Connect the overflow return pipe to the reservoir union.

f) Fit the lower closing panels of the sidemember.

11 Connect the rubber union for the corrector overflow return pipes to the reservoir. Fit the clamp and insert a rubber ring in order to avoid fracture of the union.

12 Fit the rubber collars securing the corrector overflow return pipes to the rubber return pipe from the control valve and reservoir. Place the corrector overflow return pipes in position in the clips on the lower part of the front sidemember.

13 Fit the lower closing panels under the left hand brake disc.

Fit to the side protection plates of the height correctors .... 8 mm spanner and box spanners

14 Fit the front and rear left hand wheels.

Lower the car to the ground and tighten the wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg).

Fit the left hand front and rear wings. Replace the spare wheel .... 12-14 mm spanners and box spanners

15 Start the engine and tighten the bleed screw of the pressure regulator .... 8 mm box spanner

TOOLS

Test bench 2290-T

In order to carry out this operation the test bench must be prepared as shown in Pl. 125 (test bench 2290-T) ......

CHECKING THE SETTING OF THE SUSPENSION NON-RETURN VALVES (see Pl. 131).

1 Seal the end aperture "h" of the distribution block with plug (V).

Connect the middle aperture "i" in the block to the aperture "a" of the test bench pump, using a pipe (H). Fit the outlet pipe (N) to the aperture "j".

2 Make sure that the bleed screw "b" is tightened; operate the pump in order to raise the pressure gradually. The valve must respond in the following conditions :

a) With a pressure of less than 56 lbs. sq. in. (4 kg/cm^2) no fluid should flow through the pipe (N).

b) With a pressure of more than 98 lbs. sq. in. (7 kg/cm^2) there must be a flow of fluid through the pipe (N).

NOTE - If the pressure becomes stabilised outside these limits, change the spring.

If the pressure falls to zero, the valve is not seating and the seat of the ball must be remade (see paragraph 5, Op. ID 393-3).

3 Proceed in the same way for the aperture "h" after having blocked the aperture "j".

CHECKING THE SEATING OF THE VALVES (see Pl. 130).

4 Connect the end aperture "h" of the distribution block to the aperture "a" on the test bench pump, using the pipe (H).

5 Tighten the bleed screw "b". Operate the pump to raise the pressure to 2133 lbs. sq. in. (150 kg/cm^2). The pressure gauge (M2) must not show any loss of pressure; if it does, the valve must be considered defective. The ball must be replaced and the seating remade (see Op. ID 393-3, paragraph 5).

6 Release the pressure by undoing the bleed screw "b" on the pump and repeat the preceding operations for the other aperture "j" of the distribution block.

7 Release the pressure by undoing the bleed screw "b" of the pump. Remove the pipe (H).

OPERATION No. ID 393-1 : *Replacement of a pressure distribution block*

		TOOLS
	REMOVAL.	
1	Remove the spare wheel, and the left-hand front wing. Remove the left-hand side protection panel	7-12-14 mm box spanners
2	Release the pressure by unscrewing the pressure regulator bleed screw. Retighten the bleed screw	8 mm spanner
3	Disconnect from the pressure distribution block the rear suspension feed pipe union, disconnect the pressure inlet pipe union and disconnect the front suspension feed pipe union (spanner 2221-T or 2219-T, see Pl. 61, fig. 3)	Spanner 2221-T or 2219-T
4	Remove the pressure distribution block fixing screws and remove the distribution block. Do not lose the 2 distance pieces	8 mm box spanner
	REFITTING.	
5	Fit the distribution block and the fixing screws (insert the distance pieces between the distribution block and the sidemember closing panel)	8 mm box spanner
6	Working from top to bottom, fit on the pressure distributor, the rear suspension feed pipe union, the pressure inlet pipe union and the front suspension feed pipe union (spanner 2221-T or 2219-T, see Pl. 61, fig. 3)	Spanner 2221-T or 2219-T
7	Unscrew the bleed screw of the pressure regulator.	
	Start the engine and let it run for several minutes.	
	Retighten the bleed screw. Place the system under pressure. Check the unions for leakage	8 mm spanner
8	Fit the side protection panel. Fit the wing and the spare wheel	8-12-14 mm spanners and box spanners

		TOOLS
	DISMANTLING (see Pl. 85, fig. 4).	
1	Remove the plug (17). Remove the spring (18) and the ball (19). Remove the piston (20) by tapping the block lightly on a piece of wood or eject it by means of a stream of compressed air injected through the centre hole after the end holes have been blocked	23 mm spanner
2	Remove the plug (21) and proceed in the same manner as above.	
3	Remove the seals (22) from the plugs.	
4	Clean the parts.	
	ASSEMBLY (see Pl. 85, fig. 4).	
5	Reseat the balls on their seatings. Make an imprint using a ball in good condition by gently tapping the ball with a hammer and a rod. Clean the body of the distribution block. Do not reuse the ball after this operation	Rod: 10 mm dia. Length = 100 mm
6	One one side of the block place: a piston (20) (see illustration for position of the hole "f"), a new ball (19), the spring (18), and the plug (17) complete with seal (22)	23 mm spanner
7	Proceed in the same way for the other side of the block. Make sure that the piston (20) is fitted correctly.	
8	Bench test the pressure distribution block (see Op. ID 393-0).	

PARTICULAR POINTS

Removal.

3 *Disconnect the anti-roll bars, from the half-axles (make a reference mark with paint, indicating the position of the sleeves).*

10 *Do not lose the adjusting washers fitted between the half-axles and the sidemember.*

Assembly

12 *Measure the clearance between the half-axles and the central fixing bosses and fit the adjusting washers corresponding to the clearance measured. Secure the half-axle.*

15-16 *Adjust the anti-roll bars (see Op. ID 433-0) and connect to the half-axle. Between the centres of the ball joints of the anti-roll bars, one should obtain a distance of 198 mm. on the right hand side and 199 mm. on the left hand side.*

19 *Re-adjust the front heights (see Op. ID 433-0) (measure the distance using the gauges 2307-T 175 mm. between the centre of the steering relays and the centre of the wheel hub).*

	REMOVAL (see Pl. 79 and 80).	TOOLS
1	Jack up the front of the car (jacking bracket 2505-T, see Pl. 111). Remove the front wheels, the spare wheel, the spare wheel support, the front wings and the side and lower protecting panels	Jacking bracket 2505-T 8-12-14 mm spanners and box spanners
2	Release the pressure in the suspension system by unscrewing the bleed screw of the pressure control valve and set the height control hand lever in the low position	8 mm spanner
3	Unscrew the screw of the clamp (12) fixing the corrector control rod (11).	
	Unscrew the screws of the collars (14) of the anti-roll bar coupling sleeves (15). With paint make a reference mark indicating the position of the sleeves (15) on the connecting rods and unscrew the sleeves in order to disconnect the anti-roll bar	12 mm spanner and box spanner
4	Remove the connecting pipe (9) between the distribution block and the height corrector and remove the pipe (8) connecting the height corrector to the 4-way union. Disconnect the overflow return pipe (7) and the front suspension cylinder feed pipe (10) from the height corrector (spanner 2221-T or 2219-T, see Pl. 61, fig. 3). Seal the openings of the corrector and of the pipes as they are disconnected (see Pl. 89).	
	Remove the height corrector and the support plate	Spanner 2219-T or 2221-T 12 mm box spanner
5	Remove the bearing cap (16) of the anti-roll bar	12 mm box spanner
6	Remove the suspension cylinder (see Op. ID 433-1).	
7	Remove the height corrector control rod (20)	7-8 mm spanners

		TOOLS
8	Disconnect the steering relay rod from the steering lever on the pivot (extractor 1964-T and pressure pad 1968-T, see Pl.64, fig.2)	21 mm box spanner Extractor 1964-T Pressure pad 1968-T
9	Disconnect the rubber dust cover (13) from its support on the flexible coupling (Bibax).	
10	Remove the fixing screws of the half axle and withdraw the latter. Do not mislay the adjusting washers (17) inserted between the half axle and the sidemember	19-21-23 mm box spanners
	REFITTING (see Pl.79 and 80)	
11	Offer up the half axle in position, engaging the driveshaft in the splined coupling. Secure the half axle in the following manner: the nut (32) on the locating stud (plain and serrated washers), the outer screw (33) (plain and serrated washers) and the upper inner screw (34) (plain and serrated washers).	
	Tighten these screws and the nut gently in order to seat the half axle bosses on the sidemember bosses	19-21-24 mm box box spanners
12	Using a set of feeler gauges, measure the clearance between the central fixing bosses. Select from among the shims sold by our Spare Parts Department two shims with a thickness equal to the clearance measured. Slacken the fixing system of the assembly. Place the shims in position. Insert the screws (plain and serrated washers). Tighten the screws	19-21-24 mm box spanners
	NOTE - On the early models a greater thickness of shims are required.	
13	Place the rubber dust cover (13) in position on its support on the flexible coupling (Bibax). Fit a Ligarex clip (pliers 2483-T, see Pl.17, fig.2)	Pliers 2483-T
14	Connect the steering relay rod to the pivot steering lever; insert the nylon cup and the rubber cup. Tighten the nut and insert the split pin	21 mm box spanner
15	Adjust the anti-roll bar (see Op.ID 433-0).	
16	Connect the anti-roll bar sleeve (15).	
	Screw the sleeve (15) complete with its collars (14) on to the connecting rod (35) of the buffer brackets, engaging only a few threads. Engage the threads of the sleeve on the anti-roll bar rod. Proceed in the same manner on the other side.	
	Screw up the right and left hand coupling sleeves simultaneously, until the distance "l" between the centres of the ball joints of the bar and the suspension buffer bracket is 198 mm on the right hand side and 199 mm on the left hand side.	
	The slot in the collar must be opposite the slot in the sleeve	12 mm spanner and box spanner
17	Fit the suspension cylinder (see Op.ID 433-1).	

		TOOLS
18	To fit the height corrector.	
	a) Engage spherical bearing (18) of the height corrector control rod (11) in the bore of the bearing cap (16).	
	b) Place the corrector in position with the spherical bearing engaged in the control lever (19). Tighten the fixing screws (plain and spring washers under the heads)	12 mm box spanner
	c) Fit the pipe (10) connecting the corrector to the 4-way union and fit the pipe (9) connecting the distribution block to the corrector; connect the overflow pipe (7) and the feed pipe (8) of the front suspension cylinders to the corrector (spanner 2219-T or 2221-T, see Pl.61, fig.3)	Spanner 2219-T or 2221-T
19	Preliminary adjustment of the heights.	
	a) Connect the height control rod (20) to the corrector control lever (19) (the hand control lever should be in the low position)	7 mm spanner
	b) Set the hand control lever in the high position. Make sure that the corrector slide valve is in the fully open position. (Check by trying to move it forwards with the aid of a screwdriver)	
	c) Unscrew the adjusting screw locknut (36) and put the eccentric in the neutral position by rotating the screw (37) spanner 2285-T, see Pl.64, fig.4)	Spanner 2285-T
	d) Put the gauges 2307-T in position (see Pl.113). The threaded rod (A) in the wheel hub cone and the smooth gauge rod (B) in the bore in the steering relay. Using two jacks (one under each of the lower arms) raise the whole arm assembly until the threaded gauge (A) is at a distance "n" = 175 mm from the gauge (B) of the relay. Make sure that there is a clearance of about 1 mm between the bottom of the control lever and the ball joint of the corrector (see Pl.80, fig.1). If not, adjust the position of the control rod. Tighten the clamp (12) of the control rod on the anti-roll bar. Remove the gauges 2307-T	12 mm box spanner or spanner 1677-T Gauges 2307-T
20	Start the engine, put the suspension system under pressure by re-tightening the bleed screw of the control valve and check the unions for leakage. Place the manual height control lever in the "normal" position. Fit the front wheels. Lower the car to the ground (jacking bracket 2505-T, see Pl.111). Tighten the wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg)	8 mm spanner Jacking bracket 2505-T
21	a) Adjust the heights (see Op.ID 433-0). b) Adjust the manual height control (see Op.ID 437-0)	
22	Adjust the toe-in and the steering lock (see Op.ID 440-0).	
23	Top up the fluid level in the reservoir, if necessary. Stop the engine.	
24	Fit the lower and side protector panels, the front wings, the spare wheel support and the spare wheel	8-12-14 mm spanners and box spanners

PARTICULAR POINTS.

Dismantling.

4 *In order to remove the outer races of the arm bearings from the bracket, slightly heat the bracket around the housing of the races and drive out.*

6 *Do not lose the adjusting washers of the steering coupling lever on the pivot.*

Assembly

8 a) *Do not fit the lower cup of the upper ball by means of a hammer or a press, this may damage the pivot, use the fixture 1857–T (see Pl. 63, fig. 2).*

c) *Determine the thickness of the adjusting washers of the steering lever on the pivot (see OP. ID 413–0).*

d) *Determine the thickness of the adjusting washers of the flange of the lower ball joint (feeler gauge), the clearance of the ball joint should be 0·10 mm., after tightening the flange to 36 ft.lbs. (5 m.kg.). (Do not exceed this tightening torsion.)*

e) *Tighten the wheel nut to 288 ft.lbs. (40 m.kg.).*

10 a) *Slightly heat the bracket around the bearings of the upper arm with a blowpipe in order to fit the outer bearing races. (The bearings of the lower arm will be fitted after the adjustment of the castor angle). Tighten the rear nut of the upper arm to 65 ft.lbs. (9 m.kg.) and loosen the nut by 15° to 30, then turn down the metal of the nut into the groove in the arm.*

f) *Adjust the castor angle (see paragraph 10–f), fit the outer cups of the lower arm bearings and tighten the rear nut (proceed as indicated for the upper arm, see paragraph 7).*

	REMOVAL	TOOLS
1	Place the half axle in a vice (vice support MR-3053-120, see Pl.65)	Vice support MR-3053-120
2	Disconnect the driveshaft and pivot assembly from the arms as follows:	
	a) Disconnect the lower ball first and then the upper ball (extractor and pressure pad 1864-T, see Pl.64, fig.3)	26 mm box spanner Extractor and pressure pad 1864-T
	b) Remove the rubber (7) and metal (8) cups.	
3	To remove the arms:	
	a) Extract the steel cap from the lower arm, using a screwdriver.	
	b) With a chisel, raise the metal tongue locking the nuts (21) and (22). Remove the nuts	38 mm box spanner
	c) Disengage the arms in a press or with a bronze drift. Remove the buffer arm (23) and the distance piece (24) from the upper arm.	

TOOLS

d) Remove the seals (25) and (26) from the upper arm hub and the seal (27) from the hub of the lower arm.

e) Remove the taper roller bearing races.

f) Remove the oil seal washer (28) from the arms.

4 To strip the arm bracket:

a) Clean the arm bracket.

b) Using a gas blowpipe, gently heat the bracket round the outer races. Drive out the races. If necessary tap them lightly with a sharp edged tool.
Remove the castor angle adjusting washer (29).

5 To strip the suspension buffer arm (see Pl.79).

a) Remove the rubber buffer (38).

b) Remove the adjusting nut (39) from the ball joint on the connecting rod of the anti-roll bar (spanner MR-3691-40, see Pl.64, fig.4). Remove the cup (40) and the ball (41) .... Spanner MR-3691-40

NOTE - If wear is pronounced, the buffer arm must be renewed.

6 To dismantle the pivot (see Pl.62).

a) Drill through the centre punch marks locking the screw (9) in the ring nut (10) securing the driveshaft (2 mm drill).
Remove the locking screw.

b) Place the pivot and driveshaft assembly in a vice support 1922-T, (see Pl.66, fig.1) .... Vice support 1922-T

c) Undo the half shells (15) retaining the universal joint dust cover (11) and remove the cover towards the splined end.

d) With a screwdriver release the oil seal (12) from the groove in the pivot hub.

e) Remove the driveshaft fixing ring nut (10) from the pivot hub groove as follows:
Keep the driveshaft perfectly straight and fit the spanner (spanner 1920-T, see Pl.66, fig.2). Place a tubular extension on the spanner; the nut is tightened to 288 ft.lbs (40 m.kg).
Remove the driveshaft and nut assembly from the pivot. Remove the spring (14) and cone (13).
Remove the oil seal (12) from the splined end .... Spanner 1920-T

f) To remove the upper ball:

Remove the steering lever (1) from the pivot, retaining the adjusting washers. Release the ball (3) and the distance piece (4).
Extract the lower ball socket (5) (extractor 1856-T, see Pl.63, fig.1) .... Extractor 1856-T

		TOOLS
	g) to remove the lower ball : Remove the flange (17), withdraw the ball, the upper socket (18) and the spring (19)	14 mm box spanner
	h) Remove the upper ball lubricator	8 mm box spanner
7	Clean the parts.	
	ASSEMBLY (see Pl. 62).	
8	To prepare the pivot : a) Place the pivot in a vice (vice support 1922-T, see Pl. 66, fig. 1)	Vice support 1922-T
	b) Fit the upper ball. Place the lower socket (5) in position in the pivot (fixture 1857-T, see Pl. 63, fig. 2).	
	IMPORTANT NOTE - The use of a hammer or of force to insert the socket may damage the pivot (ovality of the bearing housings).	
	Remove the flange. Insert the distance piece (4)	Fixture 1857-T
	c) Determine the thickness of the adjusting shims (6) (see Op. ID 413-0).	
	d) To fit the lower ball :	
	1. Place the upper socket (18), the ball and the flange (17) in position on the pivot. (Use a tube having an internal diameter of 39 mm and a length of 100 mm). Tap lightly with a hammer. Measure the distance between the pivot and the flange with feeler gauges. Pass the feelers all round the flange (17) in order to check that the faces are parallel. The clearance must be constant, for example: 1.30 mm. Since the ball joint must be adjusted to have a clearance of 0.10 mm, select two washers 1.30 + 0.10 = 1.40 mm thick from among those sold by our Spare Parts Department	Tube: Internal dia. = 39 mm Length = 100 mm
	2. Remove the parts.	
	3. Place the spring (19) in its housing. Place adhesive grease in the ball joint housing and smear the parts. Fit the upper socket (18), the ball, the flange (17) and the adjusting washers. Tighten the screws to 36 ft. lbs (5 m.kg). This torsion must be adhered to for excess tightening will deform the pivot.	Torsion spanner 2471-T 14 mm socket
	e) To fit the driveshaft (see Pl. 62) :	
	1. Place the pivot in a vice (vice support 1922-T, see Pl. 66, fig. 1). Put the cone (13) and the spring (14) in position. Insert the driveshaft in the pivot hub, the holes of the driving plate of the driveshaft opposite the dogs (16) on the hub and the hole for the locking screw (9) of the nut (10) opposite the threaded bore in the hub. Engage the driving dogs in their housings by tapping the end of the driveshaft. Tighten the nut (10) to 289 ft. lbs (40 m.kg) (spanner 1920-T, see Pl. 66, fig. 2) ,..	Vice support 1922-T Spanner 1920-T

		TOOLS
	2. Fit the seal (12). . Deform the seal by squeezing it, tilt the splined end of the shaft and work the seal into position by rotating it on the shaft. Do not damage the ribbing on the seal by rubbing it against the splines. Engage the seal lip in the hub groove. Use a tool with a rounded end so as not to damage the seal. Place the seal in position by running round the hub bore with the tool.	
	3. Fit the dust cover (11) (see Pl. 62) on the double universal joint. Position the retaining half-shells (15), bring the edges of the half-shells together and rivet them with a pair of universal pliers. Fit the driveshaft lubricator. Fit the locking screw (9) of the nut (10) and lock it by two centre punch marks. Fit the upper ball greaser	8 mm spanner
9	To prepare the suspension control arm (see Pl. 79).	
	a) Pack the ball joint housing with adhesive grease. Fit the socket (40). Tighten the nut (39) to 9 ft.lbs (1.2 m.kg) (spanner MR-3691-40, see Pl. 64, fig. 4)	Spanner MR-3691-40
	b) Fit the upper buffer (38). The buffer can be fitted more easily if it is first immersed in special hydraulic fluid or in water.	
10	To prepare the arm support (see Pl. 62) :	
	a) Gently heat the upper arm bearing housing by means of a blow pipe (gas). Fit the outer bearing races in position with the aid of a tube	Tube: External dia. = 71.5 mm x 150 mm long
	b) Smear the upper arm bearings with adhesive grease and place them in the bracket. Fit the gasket (25) so that the outer face thereof is at a distance of "p" = $6.25^{0}_{-0.5}$ mm from the outer face of the inner bearing race, (use the mandrel MR-3676-150, see Pl. 67, fig. 1) Fit the gasket (28) so that the outer face of the gasket is at a distance of "r" = 2.5 ± 0.25 mm from the outer face of the bracket, (use the mandrel MR-3676-140, see Pl. 67, fig. 2)	Mandrel MR-3676-140 Mandrel MR-3676-150
	c) Pack 50 gr. adhesive grease in the bore in the bracket between the two bearings.	
	d) Engage the arms in the bearings and then in the thrust ring (24) (the flat surface against the bearing). Place the suspension buffer arm (23) on the arm shaft splines. Tap the suspension buffer arm with a tube, with a block held against the other end of the arm. Make sure that the rear seal (25) is not displaced during this operation. As soon as a few threads are clear, screw on the nut (21) to complete the positioning of the arm and suspension buffer arm assembly	Tube: Internal dia = 33 mm x 150 mm long
	e) Place the assembly in a vice (vice support MR-3053-120, see Pl. 65). Fit the nut (21) and tighten to 65 ft. lbs (9 m.kg). Turn the arm while tightening to ensure perfect fitting of the bearings. Slacken off the nut by 15 to 30°. Turn down the metal of the nut collar into the groove in the arm	Torsion spanner 2471-T 8 mm socket Support MR-3053-120

TOOLS

f) To determine the thickness of the castor angle adjusting washer:

1. Fit the setting bush (1865-T, see Pl.69) on the arm.
   Fit the arm in its support. Fit the bush (1866-T, see Pl.69) on the arm. Tighten the nut (22).
   Fit the castor angle setting fixture (fixture 2321-T, see Pl.69) in position.
   Bring the rod (A) in contact with the rod (B) (with the end (D) of the rod (A) engaged in the slot (E) in the rod (B).
   The setting is obtained when the distance "f" lies between 24.75 and 25.25 mm. Measure this distance with a vernier as shown in fig.2.
   Select a washer (29) (see Pl.62) to obtain this adjustment.
   From among the washers sold by our Spare Parts Department, choose one with a thickness just greater than the dimension measured. In the case of the example mentioned above it would be 3.5 mm ....

   Setting bush 1865-T
   Setting bush 1866-T
   Fixture 2321-T

2. Remove the arm and refit it, inserting the washer (29) determined above, between the arm support and the setting bush 1865-T.
   Check the adjustment of the castor angle.
3. Remove the arm and castor angle fixture.
4. Fit the castor angle washer (29). Fit the outer ball race of the front bearing using a tube. Fit the bearing cage. Fit the seal (27) (mandrel MR 3676-140, see Pl.67, fig.2).
   Fit the outer ball race of the rear bearing in position with a tube ....

   Tube O.D. = 71.5 mm
   Length = 150 mm
   Mandrel MR 3676-140
   Tube O.D. = 61.5 mm
   Length = 150 mm

5. Pack 50 gr. of grease (special bearing grease) in the bore of the support between the two bearings. Fit the arm. Tighten the nut (22) to 65 ft.lbs (9 m.kg) (Torsion spanner 2471-T, see Pl.7, fig.2).
   Turn the arm while tightening the nut in order to make sure that the bearings are properly seated.
   Slacken off the nut by between 15 and 30°. Turn down the metal of the nut collar into the groove in the arm.
6. Pack the metal cap with grease (special bearing greasing) and place it in position, using a mallet ....

   Torsion spanner 2471-T
   38 mm socket

11 To connect the pivot (see Pl.62)
Fit the metal cup (8) and the rubber cup (7). Remove any grease on the ball pin and the arm tapers.
Engage the ball pin in the bore in the arm. Tighten the nut firmly ....

26 mm box spanner

12 Paint the assembly.

IMPORTANT NOTE - Do not get any paint on the wheel flange, the stem of the steering lever ball joint or the half axle bosses on the sidemember.

TOOLS

ADJUSTMENT OF AN UPPER PIVOT BALL JOINT

NOTE - This operation is an extremely important one since excessive tightening of the ball joint (adjusting washers too thin) will lead to deformation of the socket and rapid deterioration of the bearings.

1 In the dismantled lever (1) place the upper socket (2) and the ball (3) (see Pl.63, fig.3).

Keep the assembly under slight pressure using the body of the extractor 1856-T and a finger-tight nut (see Pl.63, fig.3)

Extractor 1856-T

2 Make sure that the face "a" of the socket is parallel to the bearing face "b" of the lever on the pivot: if not, straighten the socket and re-tighten the nut.

3 Measure the projection "c" of the socket with respect to the bearing face "b" of the lever (straight edge MR-3377 fitted with dial gauge 2437-T, see Pl.13, fig.3).

With the straight edge resting on the face "b" of the lever and the point of the dial gauge on face "a" of the socket, set the dial of the dial gauge at zero. Note the position of the totaliser needle ....

Straight edge MR-3377
Dial gauge 2437-T

4 When the distance piece (4) is in position on the lower socket (5), place the straight edge on the distance piece with the point of the dial resting on the bearing face of the washers (6) (see Pl.64, fig.1) at "d" (see Pl.63, fig.4).

Set the needles of the dial gauge to the positions they occupied formerly, and count the number of complete and partial revolutions. For example, say, 1.40 mm. To obtain a correct adjustment, this measurement must be reduced by 0.1 mm.

In the example chosen, 2 spacing washers selected from among those sold by our Spare Parts Department must be fitted and their thickness must be:

1.40 - 0.10 = 1.30 mm

ADJUSTMENT OF A PIVOT STEERING LEVER

NOTE - This operation is of extreme importance since excessive tightening of the ball joint (adjusting washers too thin) will lead to deformation of the sockets and rapid deterioration of the bearings.

1st CASE

Adjustment using instrument 1867-T

5 Place instrument 1867-T (see Pl.64, fig.1) in the dismantled lever (1). Tighten the fixing screw (A).

TOOLS

Place under each contact screw (B) one of the adjusting washers (6) found when dismantling. Screw up each contact screw (B) until the washer passes freely and without play under the point.

Lock the screws (b) with the locknuts (C). Remove the fixture from the lever .... Fixture 1867-T

6 Fit the fixture on the new lever.

From among the adjusting washers sold by our Spare Parts Department choose those which will pass freely under the point of the screws (B) in the same conditions as in paragraph 5.

Mark the position of the adjusting washers. Remove the fixture.

2nd CASE.

Adjustment using a dial gauge (see paragraphs 1 to 4, this operation).

Particular Points.

Replacement of a pivot steering lever.

Removal.

9 *Mark the position of the adjusting washers on the lever.*

Assembly.

10 *Determine the thickness of the adjusting washers to be fitted with the new lever (see Op. ID. 413–0, paragraphs 5 and 6).*

11 *Tighten the lever fixing screws to 36 ft.lbs. (5 m.kg.). (Do not exceed this tightening torsion, use a torsion spanner 2471–T).*

15 *Check the alignment and the steering lock. Check the functioning of the other ball joints, (steering levers, lower relay levers).*

Replacement of an upper pivot ball joint.

22 *The fitting of the lower cup by means of a hammer or a press is detrimental to the pivot, use the fixture 1857–T (see Pl. 63, fig. 2).*

23 *Determine the thickness of the adjusting washers of the ball joint (see Op. ID. 413–0 paragraphs 1 to 4).*

24 *Tighten the lever fixing screws to 36 ft.lbs. (5 m.kg.). (Do not exceed this tightening torsion, use a torsion spanner 2471–T).*

Replacement of a lower pivot ball joint.

31 *Determine the thickness of the flange adjusting washers (feeler gauge). The clearance of the ball joint should be 0·1 mm. after tightening the flange to 36 ft.lbs. (5 m.kg.). (Do not exceed this tightening torsion, use a torsion spanner 2471–T).*

Replacement of a wheel locking cone.

34 *It is necessary to remove the pivot and driveshaft assembly and disconnect the driveshaft from the pivot in order to carry out this operation (see Op. ID. 372–1).*

Replacement of a wheel positioning dowel.

38 *This operation requires the removal of the wheel.*

TOOLS

REPLACEMENT OF A PIVOT SEAL

Removal (see Pl. 62).

1 Remove the pivot and driveshaft assembly (see Op. ID 372-1, paragraphs 1 to 4).

2 Place the pivot and driveshaft assembly in a vice (vice support 1922-T, see Pl. 66, fig. 1).

Remove the seal (12) using a screwdriver .... Vice support 1922-T

		TOOLS
	Refitting (see Pl. 62).	
3	To fit the seal (12) : Deform the seal by hand, tilt the drive sliding coupling and work the seal on to the splined end; do not damage the inner ribbing of the seal by rubbing it on the coupling splines. Engage the outer lip of the seal in the hub groove. Use a tool with a rounded end so as not to damage the seal. Put the seal into position by working round the hub bore with the tool.	
4	Fit the pivot and driveshaft assembly on the vehicle (see Op. ID 372-1, paragraphs 10 to 13).	
	REPLACEMENT OF A PIVOT STEERING LEVER	
	Removal (see Pl. 62 and 64).	
5	Jack up the front of the car (jacking bracket 2505-T, see Pl. 111). Remove the wheel	Jacking bracket 2505-T
6	Release the pressure in the suspension system by unscrewing the bleed screw of the pressure control valve	8 mm spanner
7	Disconnect the lever (1) from the steering rod (extractor 1964-T and pressure pad 1968-T, see Pl. 64, fig. 2). Remove the rubber and nylon cups	21 mm box spanner Extractor 1964-T Pressure pad 1968-T
8	Disconnect the upper arm from the upper pivot ball joint (3) (extractor and pressure pad 1864-T, see Pl. 64, fig. 3). Remove the rubber (7) and nylon (8) cups	Extractor and pressure pad 1864-T 26 mm box spanner
9	Remove the lever (1). Mark the position of the adjusting washers (6)	14 mm box spanner
	Refitting (see Pl. 62 and 64).	
10	Determine the thickness of the adjusting washers (6) to be fitted with the new lever (see Op. ID 413-0).	
11	Place the adjusting washers (6) and the lever (1) in position. Tighten the lever fixing screws to 36 ft.lbs (5 m.kg) (spring washers under heads) (use a torsion spanner 2471-T (see Pl. 7, fig. 2), this tightening torsion is very important	Torsion spanner 2471-T Socket 14 mm
12	Connect the upper arm to the ball joint (3). Insert the nylon cup (8) and the rubber cup (7). Carefully remove all grease from the tapers of the ball joint and the arm. Tighten the nut and split pin	26 mm box spanner
13	Connect the steering lever (1) to the ball joint. Insert a nylon cup and a rubber cup. Carefully remove all grease from the tapers of the ball joint and the lever. Tighten the nut and split pin	21 mm box spanner

		TOOLS
14	Fit the wheel. Put the suspension system under pressure. Lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg)	8 mm spanner
	NOTE - If the work carried out has been made necessary by seizure of the ball joint, even at the limits of its movement, it is necessary to replace the other lever and the two lower relay levers.	
15	Check the alignment and steering lock (see Op. ID 440-0). Adjust as required.	
	REPLACEMENT OF AN UPPER PIVOT BALL JOINT	
	Removal (see Pl. 62 and 64).	
16	Release the pressure in the suspension system by unscrewing the bleed screw of the pressure control valve and jack up the front of the car (jacking bracket 2505-T, see Pl. 111). Remove the wheel	8 mm spanner Jacking bracket 2505-T
17	Disconnect the upper arm from the upper pivot ball joint (3) (extractor and pressure pad 1864-T, see Pl. 64, fig. 3). Disengage the rubber cup (7) and the nylon cup (8)	26 mm box spanner Extractor and pressure pad 1864-T
18	Disconnect the lever (1) from the steering rod (extractor 1964-T and pressure pad 1968-T, see Pl. 64, fig. 2). Disengage the rubber cup (7) and the nylon cup (8)	21 mm box spanner Pressure pad 1968-T Extractor 1964-T
19	Remove the lever (1), disengage the ball joint (3), the upper socket (2), the adjusting washers (6) and the distance piece (4).	
20	Remove the lower socket of the ball joint (5) (extractor 1856, see Pl. 63, fig. 1)	Extractor 1856-T
21	Carefully clean all the parts.	
	Refitting (see Pl. 62 and 64).	
22	Place the lower socket (5) of the ball joint in position (fixture 1857-T, see Pl. 63, fig. 2). Place the distance piece (4) in position	Fixture 1857-T
	IMPORTANT NOTE - Forcing it in position by means of a hammer or with a press will cause damage to the pivot (ovality of the bores and the bearing sockets).	
23	Determine the thickness of the adjusting washers to be used (see Op. ID 413-0).	
24	First oil and then fit the ball joint (5). Place the washers (6) and the lever (1) in position. Tighten the lever fixing screws to 36 ft.lbs (5 m.kg) (spring washers under heads). (Use a torsion spanner 2471-T, see Pl. 7, fig. 2). The correct tightening torsion is extremely important	Torsion spanner 2471-T 14 mm socket

		TOOLS
25	Connect the upper arm to the ball joint (3). Insert the nylon cup (8) and rubber cup (7). Carefully remove all grease from the tapers of the ball joint and the arm. Tighten the nut and split pin	26 mm box spanner
26	Connect the steering lever (1) to the ball joint. Insert the nylon and the rubber cups. Remove all grease from the tapers of the ball joint and the lever. Tighten the nut and split pin	21 mm box spanner
27	Refit the wheel. Place the suspension system under pressure. Lower the vehicle to the ground. Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg).	

REPLACEMENT OF A LOWER PIVOT BALL JOINT

Removal (see Pl. 62).

28	Jack up the front of the car (jacking bracket 2505-T, see Pl. 111) and remove the wheel	Jacking bracket 2505-T
29	Disconnect the lower arm from the lower ball joint of the pivot (extractor and pressure pad 1864-T, see Pl. 64, fig. 3). Disengage the rubber cup (7) and the nylon cup (8)	Extractor and pressure pad 1864-T
30	Remove the fixing screws of the flange (17). Remove the flange (17), the adjusting washers, the ball joint, the upper socket (18), and the spring (19)	14 mm box spanner

Refitting (see Pl. 62).

31	To assemble the lower ball joint : a) Place the upper socket (18), the ball and the flange (17) in position. Seat the flange on the pivot as far as possible (use a tube of 39 mm internal diameter and 100 mm long). Tap gently with a hammer. Measure the clearance between the pivot and the flange using a set of feeler gauges. Run the feeler gauges all round the flange to make sure that it is level; the clearance must be constant all round, for example: 1.30 mm. The ball joint must be adjusted with a clearance of 0.10 mm; therefore choose two washers (6) (see Pl. 64), having a thickness of 1.30 + 0.10 = 1.40 mm from those sold by our Spare Parts Department	Tube: Internal dia. = 39 mm Length = 100 mm
	b) Remove the parts.	
	c) Place the spring (19) for taking up the clearance in its housing. Introduce adhesive grease in the housing of the ball joint and smear the parts. Place the upper socket (18), the ball, the flange (4) and the washers (6) in position (see Pl. 64). Tighten the screws to 36 ft.lbs (5 m.kg). This tightening torsion must not be exceeded. Excessive tightening will deform the pivot. (Torsion spanner 2471-T, see Pl. 7, fig. 2)	Torsion spanner 2471-T 14 mm socket
32	Carefully remove all grease from the tapers of the ball joint and the lower arm. Place the nylon cup (8) and rubber cup (7) in position and connect the lever to the ball joint. Tighten the nut and split pin	26 mm box spanner

		TOOLS
33	Fit the wheel. Lower the vehicle to the ground (jacking bracket 2505-T, see Pl. 111). Tighten the fixing screws to 108 to 144 ft. lbs (15 to 20 m. kg)	Jacking bracket 2505-T
	REPLACEMENT OF A WHEEL LOCKING CONE	
	Removal (see Pl. 62).	
34	Remove the pivot and driveshaft assembly, disconnect the driveshaft from the pivot (see Op. ID 372-1, paragraphs 1 to 5).	
35	Remove the spring (14) and the wheel locking cone (13).	
	Refitting (see Pl. 62).	
36	Place the wheel locking cone (13) in position, with the dowel engaged in one of the slots in the hub and place the spring (14) in position.	
37	Connect the driveshaft to the pivot and fit the pivot and driveshaft assembly on the car (see Op. ID 372-1, paragraphs 6 to 13).	
	REPLACEMENT OF A WHEEL POSITIONING DOWEL	
	Removal (see Pl. 62).	
38	Jack up the front of the car (jacking bracket 2505-T, see Pl. 111) and remove the wheel	Jacking bracket 2505-T
39	Drive out the dowel (20) by inserting a drift through the slot opposite the dowel	Drift 5 mm dia. Length 120 mm.
	Refitting (see Pl. 62).	
40	Place the dowel in its housing in the hub and fit, using a drift	Drift 8 mm dia. Length 60 mm
41	Fit the wheel. Lower the car to the ground. Tighten the wheel fixing screws to 108 to 144 ft. lbs (15 to 20 m. kg).	

PARTICULAR POINTS

Removal.

5 *Mark the position of the corrector control rod clamp before disconnecting it from the anti-roll bar.*

9 *The suspension cylinder piston rod cannot be removed until the holes for the connecting pin (in the rod and in the buffer support) are parallel.*

Refitting.

15 *Check that there is a clearance of not less than 0·5 mm. between the arm and the steel stop welded on the body (at "a", see Pl. 81). If necessary file the stop. Make sure that the piston rod is in good contact with the ball, before fitting the connecting pin.*

18 *Give equal clearance on both sides of the anti-roll bar so that the marks made when removing the corrector control rod, correspond, giving a clearance of 1 mm. approximately between the corrector ball and the base of the fork of the control lever.*

20 *Make sure that the pipes fit correctly in the unions, when refitting the rear brake articulating pipe.*

21 *Bleed the rear brakes (see Op. ID 453–0). Adjust the heights (see Op. ID 433–0).*

	REMOVAL	TOOLS
1	Put the rear of the car on stands (jacking bracket 2505-T, see Pl.111)	Jacking bracket 2505-T
2	Remove the rear wing, remove the wheel	14 mm box spanner
3	Remove the mud shield from the height corrector	
4	Remove the rear crossmember closing panel. Remove the rear seat squab.	
5	Disconnect the clamp (9) on the corrector control rod (10) after having marked its position on the anti-roll bar (see Pl.81) (12 mm spanner or spanner 1677-T, see Pl.54, fig.4)	12 mm spanner or 1677-T spanner
6	Disconnect the anti-roll bar coupling flanges (11) and disengage the anti-roll bar (see Pl.81)	14-16 mm box spanners
7	Clear the metal, locking the ring nut (52) from the groove in the sidemember (see Pl.71). Remove the nut (spanner 1757-T, see Pl.72, fig.1)	Spanner 1757-T
8	To remove the brake pipe assembly (see Pl.81):	
	a) Remove the bleed screw and disconnect the brake feed pipe from the wheel cylinder (spanner 2219-T or 2221-T, see Pl.61, fig.3)	Spanner 2219-T or 2221-T
	b) Remove the locking screw (5) from the rotating union (6)	10 mm spanner 5-8 mm ring spanner

		TOOLS
	c) Disconnect the 3-way union from the feed pipe and the right hand brake pipe (spanner 2219-T or 2221-T)	Spanner 2219-T or 2221-T
	NOTE - In order to remove the right hand half-axle, remove the rear wing, the wheel and the left hand mudshield and cut the adhesive tape fixing the pipes in the sidemember, in order to remove the pipe assembly.	
9	To disconnect the piston rod (4) (see Pl.82):	
	a) Remove the connecting pin (5).	
	b) Remove the clip (12) fixing the ball joint dust shield to the buffer support and disengage the dust shield (6) towards the rear.	
	c) *Press on the arms* and disengage the piston rod (the rod can be removed only when the holes for the connecting pin in the rod and in the buffer support are parallel).	
10	Remove the 3 nuts fixing the bearing housing on the sidemember. Disengage the arm (if necessary strike the end of the spindle with a mallet (see Pl.71))	Ratchet spanner 14 mm socket and extension
11	Drive out the housing fixing screws (53) (only if they are damaged or worn) (do not lose them inside the sidemember).	
12	Clean the housing with petrol in order to remove the ball (11) from the buffer support (7) (see Pl.82).	
	ASSEMBLY (see Pl.71).	
13	Hammer in position the screws (53) fixing the bearing housing in the sidemember.	
14	Fit the arm in the sidemember and provisionally screw on the ring nut (52), the thin collar in contact with the sidemember.	
15	Tighten the 3 shouldered nuts fixing the bearing housing (do not fit washers). Check that there is not less than 0.5 mm clearance between the arm and the steel stop at "a" (see Pl.81). To do this, remove the front buffer. If necessary file the stop	Ratchet spanner 14 mm socket and extension
16	Finally tighten the ring nut (52) (spanner 1757-T, see Pl.72, fig.1). Knock over at one point the metal of the nut into one of the grooves in the sidemember (see Pl.71)	Spanner 1757-T
17	To fit the piston rod (see Pl.82).	
	a) Put the ball (11) previously greased in its housing, the arm being in its lowest position.	

		TOOLS
	b) Engage the piston rod (4) in the buffer support and line up the holes for the connecting pin (5) in the piston rod, in the dust cover (6) and in the buffer support (7). Fit the connecting pin with the longest leg through the buffer support. Turn down the end of the connecting pin on the support (see fig. 2). Fit the clip (12) on the dust cover (6).	
	NOTE - Before fitting the connecting pin, make sure that the piston rod is in good contact with the ball; so that when raising the arm, the piston rod will not slip out of the buffer support.	
18	To fit the anti-roll bar (see Pl. 81). Give equal clearance on both sides. Refit the anti-roll bar in the original position so as to be able to line up the marks made when dismantling the corrector control rod. Tighten the screw of the flange (11) to 36 ft.lbs (5 m.kg)	14-16 mm box spanners
19	Place the corrector control rod (10) on the mark made when dismantling so as to give a clearance of 1 mm approximately between the corrector ball and the base of the fork of the control lever. Tighten the clamp (9) (see Pl. 81)	12 mm spanner
	NOTE - If the anti-roll bar or the corrector control rod have been replaced, re-adjust the heights. In order to do this: a) Place the two arms in a position to obtain a dimension of 35 mm at "c" between the upper edge of the buffer and the upper edge of the buffer stop (see Pl. 82). b) Set the height corrector in the full open inlet position. Tighten the clamp.	
20	To fit the brake pipes (see Pl. 81).	
	a) Engage the trunnion of the union in the bore of the arm spindle. Tighten the locking screw (5) moderately. Tighten the locknut	5-8 mm ring spanners
	b) Connect the pipe (1) to the wheel cylinder and fit the bleed screw (spanner 2219-T or 2221-T, see Pl. 61, fig. 5).	Spanner 2219-T or 2221-T 10 mm spanner
	c) Align the pipe (54) so that the centre line of the brake feed pipes (2 and 3) fit in the centre of the 3-way union.	
	NOTE - This operation is very important. It is necessary that the articulating movement is not under strain, otherwise there is a risk of seizure.	
	d) Tighten the pipe union nuts on the 3-way union	Spanner 2219-T or 2221-T
	NOTE - If the right-hand half-axle has been removed, do not fit either the protection panel or the left-hand wing.	
21	Fit the wheels and lower the car to the ground. Bleed the brakes (see Op. ID 453-0).	

		TOOLS
22	Put the car on a ramp. Adjust the heights (see Op. ID 433-0).	
23	Put the car on a stand (jacking bracket 2505-T, see Pl. 111). Remove the left-hand wheel. Fit the mud shield and refit the wheel, lightly oil the hexagon	Jacking bracket 2505-T
24	Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg). Fit the rear wing	14 mm box spanner
25	Fix the pipe assembly in the sidemember by using two or three turns of adhesive tape, at the ends and in the centre.	
26	Fit the rear crossmember closing panel and the rear seat squab.	

PARTICULAR POINTS

Removal.

2 *Remove the stub axle from the arm, using the extractor 2018–T (see Pl. 74). Remove the outer cup of the outer bearing from the hub, using the extractor 2019–T (see Pl. 75). Remove the inner cup of the outer bearing from the hub using the extractor 2020–T, (see Pl. 72).*

Assembly.

10 *Grind the brake drums; do not increase the diameter by more than 2 mm., the original diameter is 225 mm. The maximum tolerance for eccentricty is 0.04 mm.*

11 *If the arm or one or both bearings have to be replaced it is necessary to use a distance piece which will enable the correct adjustment to be obtained. The length of this distance piece is determined by using the fixture 2021–T (see paragraph 12b see Pl. 77).*

12 *Fit the seal so that the distance "b" is 4.5 mm. from the face of the hub (mandrel MR.3676–170).*

13 *Tighten the stub axle nut to 72 ft. lb. (10 m.kg.). Tighten the articulating spindle nut to 65 ft. lb. (9 m.kg.), untighten the nut 1/6th of a turn and knock down the metal of the nut into the slot of the shaft.*

	DISMANTLING.	TOOLS
1	Place the axle arm in a vice (vice bracket MR-3053-90, see Pl. 73)	Vice bracket MR-3053-90
2	To remove the stub axle (see Pl. 70) :	
	a) With a chisel prise off the hub sealing cap (17).	
	b) Lock the drum by tightening the brake adjusting cams. Remove the stub axle nut (18), the nut locking plate and the bearing thrust washer (19).	
	c) Unlock the brake drum. Remove the drum fixing screws and remove the drum, after marking its position on the hub.	
	d) Remove the stub (extractor 2018-T, see Pl. 74). Remove the bearing (20) and the distance piece (21). Do not allow the balls of the outer bearing (22) to scatter	36 mm box spanner Extractor 2018-T
3	To remove the articulating bearing housing (see Pl. 71). Remove the nut (23) and withdraw the bearing housing and the inner bearing (24). Withdraw the seal (33) and the roller cage (34) from the bearing housing	40 mm spanner
4	To strip the arm (see Pl. 70). a) Remove the oil retainer (25) from the stub axle. b) Remove the brake backplate (spanner 1677-T, see Pl. 54, fig. 4). c) Remove the seal (26) and the outer race (27) of the outer bearing (22), (extractor 2019-T, see Pl. 75).	

		TOOLS
	d) Drive out the outer race (28) of the inner bearing (20) using a tube.	
	e) Drive out the oil retainer (29) (see Pl. 71) using a chisel. Take care not to damage the articulating spindle	Extractor 2019-T Spanner 1677-T Tube : 53.5 mm external dia. Length = 200 mm
5	To strip the stub axle (see Pl. 70) :	
	a) Remove the inner race of the outer bearing (extractor 2020-T, see Pl. 72, fig. 2). Remove the bearing distance piece (30).	
	b) Remove the wheel locking cone (31) and the spring (32). Remove the wheel positioning dowel (51) using a drift....	Extractor 2020-T
6	To strip the brake backplate (see Pl. 102):	
	a) Remove the brake shoe return spring (35) (spring pliers 2110-T, see Pl. 103)	Spring pliers 2110-T
	b) Remove the cups (36) by rotating them through ¼ turn to release them from their guide pins. Remove the spring (37) and the guide pins (38).	
	c) Remove the nuts of the anchor pins (40), the locking plate (41), the brake shoes and the eccentric bushes (42). Drive out the anchor pins (40) from the brake plate	21 mm box spanner
	d) Remove the wheel cylinder. Remove the rubber caps (45), the pistons (46), the circlips (47) and the bleed screw.	8-12 mm box spanners
	e) Unrivet and remove the brake shoe adjusting cams (48) (assembly MR-3354-40, see Pl. 105)..................	Assembly MR-3354-40
7	Clean the parts.	
	ASSEMBLING.	
8	To prepare the wheel cylinder (see Pl. 102) :	
	Use only alcohol or hydraulic brake fluid for cleaning the parts. Any other substance will cause rapid deterioration of the rubber seals. Moisten the cylinder and the pistons with brake fluid. Fit the circlips (47), the pistons (46) complete with seal (49) and the rubber caps (45).	
9	To prepare the brake plate (see Pl. 102) :	
	a) Fit the adjusting cams (48) and rivet the pins (assembly MR-3354-40, see Pl. 105)	Assembly MR-3354-40
	b) Fit the anchor pins (40) and do this by using a bronze drift.	
	c) Fit the wheel cylinder (spring washer under the fixing screw heads)	12 mm box spanner

TOOLS

d) Fit the eccentric adjusting bushes (42) on the brake shoes.

Fit the brake shoes on the lightly oiled anchor pins (40). Place the locking plate (41) in position and screw on the nuts.

e) Fit the guide pins (38), the springs (37) and the cups (36), giving the latter a $\frac{1}{4}$ turn to lock them on the guide pins.

f) Fit the brake shoe return springs (35) (spring pliers 2110-T, see Pl.103)

Pliers 2110-T

10 To grind the drums:

Grind the shoe bearing surfaces on a lathe (mandrel MR-3700-120, see Pl.104, fig.1 and 3). Do not increase the original diameter, which is 255 mm, by more than 2 mm. The maximum tolerance for eccentricity is 0.04 mm. Check this tolerance with a dial gauge. To ensure perfect concentricity, mount the mandrel between centres (see Pl.104)

Mandrel MR-3700-120

11 To prepare the stub axle bearing (see Pl.70)

a) Fit the outer races (27) and (28) of the bearings (22) and (20) by means of a press. Lightly grease the races to facilitate their assembly (79.5 mm dia. tube for the race of bearing (22) and 61.5 mm dia. tube for the race of bearing (20), or use screw MR 4114 (see Pl.77, fig.3) to fit races (27) and (28) by hand)

Tube 79.5 mm O.D.
x 150 mm long
Tube 61.5 mm O.D.
x 150 mm long
or screw MR 4114 and
29 and 42 mm box spanners

b) To find the length of the distance piece (21) required.

IMPORTANT NOTE - If the arm, or one or both bearings have to be replaced the distance piece fitted must enable the correct adjustment to be obtained. For this purpose proceed as follows (fixture 2021-T, see Pl.77)

1. To set the dial gauge (see fig.1)
Place the outer bearing (inner race and ball cage assembly) on a surface plate. Fit the support plate (A) together with the dial gauge 2437-T on the bearing race. Set the dial at "O" and mark the position of the totaliser needle (the reading of the gauge should be between 4 and 5 mm)

Fixture 2021-T
Dial gauge 2437-T

2. Place the fixture in position in the hub arm (see fig.2)
Engage the inner bearing on the shaft (B) of the fixture with the inner race in contact with the spring (C).

Engage the assembly in the hub arm and then place on the shaft (B) the bush (D), the bush retaining spring (E), the inner race and ball cage assembly of the outer bearing, the support plate (A) and dial gauge assembly and the thrust washer (F). Tighten the nut (G). Care should be taken not to disturb the dial gauge. Turn this assembly several times to make sure that the bearings are in position.

TOOLS

3. Bring the needles of the dial gauge to their original positions. Allow the dial gauge spindle to return slowly until it is in contact with the bush and then count the complete and partial revolutions, let us say for example 0.97.

In order to obtain a bearing adjustment with a clearance of "O", the length of the distance piece would be 0.97 mm plus the length of the bush. This latter length is stamped on the bush, for example 74.71 mm.

The length of the distance piece to be fitted should be: 74.71 + 0.97 = 75.68 mm.

NOTE - In order to facilitate the stocking of the parts, our Spare Parts Department sells only one distance piece and this is 72.78 ± 0.02 mm long. Only the hundredths are marked on the distance piece. For example, "80" means that the length of the distance piece is 72.80 mm (dimension measured under load and therefore cannot be checked with a vernier. A range of washers enables the required adjustment to be obtained.

In the example chosen we have found that to obtain a clearance of "O", the distance piece would have to be 75.68 mm long.

If the length of the new distance piece is 72.80 mm, the thickness of the washer would therefore be:

75.68 - 72.80 = 2.88 mm.

From among the washers sold by our Spare Parts Department choose the one which will give the correct adjustment; in the example chosen use washer D-426-322. (The washers are marked with the three last figures of their part number).

IMPORTANT NOTE - In the event of the thickness of the washer being equal to the limit dimension of a washer:

1. For example 2.86, then choose the washer of the next smaller size: D-426-321 (2.82 to 2.96 mm).
2. For example 2.90, then choose the washer D-426-322 (2.86 to 2.90 mm).
3. Remove the fixture.

12 To prepare the arm (see Pl.70):

a) Grease the outer bearing (22) and place it in position.
Fit the seal (26) so that it is at a distance "b" 4.5 mm from the face of the hub (mandrel MR-3676-170, see Pl.104, fig.2) .... Mandrel MR-3676-170

b) Fit the brake backplate. Tighten the screws to 17$\frac{3}{4}$ ft.lbs (2.4 m.kg) (spring washer) (spanner 1677, see Pl.54, fig.4) .... Spanner 1677-T

c) Fit the oil retainer (25).

13 To fit the stub axle and drum assembly on the arm (see Pl.70):

a) Fit the wheel locking cone (31) and its spring (32), first oiling them lightly.

b) Keep the stub axle vertical (support 1922-T, see Pl.66, fig.1). Engage the bearing stop (30) on the stub axle ..... Support 1922-T

TOOLS

c) Place the axle arm on the stub axle. Hold the arm with the hand and engage the bearing (22) on its journal on the stub axle using a press and a tube (tube 32 mm outside dia.)

Introduce 100 g. special bearing grease into the bearing housing.

Fit the distance piece (21) and the washer (50) determined according to paragraph 12.

First grease and then fit the ball race (20). Fit the inner race with the help of a press.

Place in position the bearing thrust washer (19) (see Pl.70 for correct positioning), the locking piece and the nut (18). Tighten the nut to 72 ft.lbs (10 m.kg) (grease faces and threads). Turn down the locking piece.

Fit the sealing cap (17) filled with grease (special bearing grease). Fit the rubber seal of the oil retainer drain tube ....

Tube o.d. 32 mm
i.d. 25 mm
length 250 mm
36 mm box spanner

14 Remove the drum (see Pl.102).

Centre the brake shoes by means of the eccentric bushes (42) and the cams (18) (centering fixture 2115-T, see Pl.106)

Lock the nuts of the anchor pins (40) and insert split pins. Fit the drum. Locate it in accordance with the marks made during dismantling (see paragraph 2c). Fit the wheel positioning dowel (51) ....

Fixture 2115-T
21 mm box spanner

15 To fit the articulated bearing housing (see Pl.71):

a) Fit the sealing cup (29) by means of a tube (tube, o.d. 60 mm).

b) In the housing place the bearing (34) and fit the seal (33) with a tube of o.d. 79 mm.

c) Fit the prepared housing on the articulating spindle of the arm.

d) Pack 50 g. adhesive grease into the housing.

Place in position the inner bearing (24), the nut (23) complete with the steel cup washer and rubber seal. Tighten the nut to 58-65 ft.lbs (8 to 9 m.kg) (grease faces and threads), turning the body of the bearing in order to position the rollers. Slacken the nut 1/6 of a turn and turn down the metal of the nut into the slot on the shaft.

Tube o.d. 60 mm
i.d. 56 mm
length 200 mm
Tube o.d. 79 mm
i.d. 67 mm
length 100 mm

NOTE - If the part of the nut already used for locking it on the shaft is opposite the slot in the shaft, the nut must be renewed without attempting to alter the conditions of adjustment.

16 Remove the arm from the vice bracket.

17 Paint the assembly.

PARTICULAR POINTS

Replacement of a wheel stub.

5 *Fit the seal so that the distance "b" is 4.5 mm. from the outer face of the axle arm hub.*

7 *Tighten the hub nut to 72 ft.lbs. (10 m.kg.). Centralise the brake shoes (fixture 2115–T, see Pl. 106).*

Replacement of a bearing seal or a bearing bush.

In order to carry out this operation it is preferable to remove the half-axle.

Replacement of a wheel locking cone.

21 *Press the cone into the thrust spring housing then turn it 1/4 of a turn in order to remove (it is not necessary to remove the wheel hub).*

		TOOLS
	REPLACEMENT OF A WHEEL STUB OR STUB BEARINGS	
	Removal (see Pl.70).	
1	Jack up the rear of the car (jacking bracket 2505-T, see Pl.111). Remove the wing and the wheel	Jacking bracket 2505-T 14 mm box spanner
2	To remove the stub axle:	
	a) Place the half axle in a vice (vice bracket 3053-90, see Pl.73)	Vice bracket MR-3053-90
	b) Remove the hub sealing cap (17). Immobolise the drum by tightening the brake shoe adjusting cams. Remove the nut (18), the lockplate and the thrust washer (19)	36 mm box spanner
	c) Unscrew the brake shoe adjusting cams. Unscrew the brake drum fixing screws and remove the drum.	
	d) Remove the stub axle (extractor 2018-T, see Pl.74)	Extractor 2018-T
	e) Remove the bearing (20) and the distance piece (21). Take care not to scatter the balls of the outer race (22).	
	Remove the seal (26) and remove the bearing cup (27) of the outer bearing (22) from the axle arm (extractor 2019-T, see Pl.75)	Extractor 2019-T
3	To strip the stub axle:	
	a) Remove the inner bearing cup of the outer bearing from the hub (extractor 2020-T, see Pl.72, fig.2) and remove the stop (30)	Extractor 2020-T
	b) Remove the wheel locking cone (31) by forcing it into the housing of the spring (32) and by pivoting it around an axis passing through the locking dowel (39). Remove the spring (32).	
	c) Remove the wheel positioning dowel (51) using a drift.	

		TOOLS
	Refitting (see Pl. 70).	
4	To prepare the hub bearings :	
	a) Fit the outer bearing cup (27) of the outer bearing (22) and fit the inner bearing (20) in the hub, using a press. Lightly grease the outer bearing cups in order to facilitate fitting (screw MR-4114, see Pl. 77, fig. 3)	Screw MR-4114 29-42 mm box spanners
	b) Determine the length of the distance piece (21) (see Op. ID 420-3, paragraph 12 b).	
	c) Grease the outer bearing (22) and place it in position. Fit the sealing ring (26) at a distance "b" = 4.5 mm from the outer face of the axle arm.	
5	To assemble the hub :	
	a) Place the spring (32) and the wheel locking cone (31) in position after oiling them.	
	b) Fit the wheel positioning dowel (51). Place it on the housing and fit it into position with the aid of a drift..........	Drift dia. = 8 mm Length = 80 mm
	c) Keeping the hub in a vertical position (support 1922-T, see Pl. 66, fig. 1) place the stop (30) in position, using a tube	Support 1922-T Tube : Internal dia. = 25 mm External dia. = 32 mm Length = 250 mm
6	To fit the hub :	
	a) Place the stub axle on the axle arm. Hold the arm with the hand and engage the bearing (22) on the stub axle journal using a press and a tube.	
	b) Pack 100 gr. special bearing grease in the bearing housing.	
	c) Fit the distance piece and the washer determined in paragraph 4 b).	
	d) Grease the ball cage (20) and fit. Fit the inner cage in position.	
	e) Fit the bearing thrust washer (19) (see Pl. 70 for correct positioning), the lockplate and the nut (18). Tighten the nut to 72 ft.lbs (10 m.kg) (grease faces and threads). Lock the nut. Fit the hub sealing cap (17) packed with grease (special bearing grease). Fit the rubber seal of the oil retainer drain tube	Tube : Internal dia. = 25 mm External dia. = 32 mm Length = 250 mm 36 mm box spanner
7	Centre the brake shoes by means of the eccentric bushes (42) and the cams (48) (see Pl. 102) (fixture 2115-T, see Pl. 106).	
	Lock the nuts of the brake shoe anchor pins. Turn down the locking piece (41)	Fixture 2115-T 21 mm box spanner

		TOOLS
8	Fit the wheel and the wing. Lower the car to the ground (jacking bracket 2505-T, see Pl. 111) and tighten the wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg)	Jacking bracket 2505-T 14 mm box spanner
	REPLACEMENT OF A BEARING SEAL OR OF A BEARING BUSH	
	Removal (see Pl. 70).	
9	Jack up the rear of the car (jacking bracket 2505-T, see Pl. 111). Remove the wing and the wheel.	Jacking bracket 2505-T 14 mm box spanner
10	To remove the hub.	
	a) Remove the metal hub sealing cap (17). Immobilise the drum by tightening the brake shoe adjusting cams; remove the nut (18), the locking plate and the thrust washer (19)	36 mm box spanner
	b) Unscrew the brake shoe adjusting cams and remove the hub and drum assembly (extractor 2018-T, see Pl. 74). If necessary (half-axle not removed), remove the front rubber clearance stop in order to facilitate insertion of the extractor	Extractor 2018-T
11	Remove the sealing ring (26).	
	Refitting (see Pl. 70).	
12	When the outer bearing (22) is in position, fit the sealing ring (26) at a distance of "b" = 4.5 mm from the outer face of the axle arm.	
13	Make sure that the bearing surface of the sealing ring on the bearing stop (30) is not pitted or scored; if it is it must be renewed.	
14	Place the hub and drum assembly on the axle arm and insert this assembly in the bearings (20) and (22). Fit the thrust washer (19), the lockplate and the nut (18). Immobilise the brake drum by tightening the brake shoe adjusting cams. Tighten the nut (18) to 72 ft.lbs (10 m.kg) (grease faces and threads). Lock the nut	36 mm box spanner
15	Untighten the brake shoe adjusting cams.	
16	Fit the wheel and the wing. Lower the car to the ground (jacking bracket 2505-T, see Pl. 111).	
	Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg)	Jacking bracket 2505-T

		TOOLS
	REPLACEMENT OF A WHEEL LOCKING CONE.	
	Removal (see Pl. 70).	
17	Jack up the rear of the car (jacking bracket 2505-T, see Pl. 111). Remove the wing and the wheel	14 mm box spanner Jacking bracket 2505-T
18	To remove the wheel locking cone : Press the cone (31) into the housing of the spring (32) and pivot it through a quarter turn round an axis passing through the centre of the cone locking dowel (39).	
	Refitting (see Pl. 70).	
19	Oil the cone (31) and place it in the hub (the locking dowel engaging in one of the slots in the hub) and pivot it through a quarter turn at the same time forcing it into the housing of spring (32) in order to bring it into position.	
20	Fit the wheel and rear wing. Lower the car to the ground (jacking bracket 2505-T, see Pl. 111). Tighten the fixing screw of the wheel to 108 to 144 ft.lbs (15 to 20 m.kg)	Jacking bracket 2505-T 14 mm box spanner

PARTICULAR POINTS

Pre-adjustment of the front heights.

4 *The corrector control rod being free, one should obtain a distance "n" = 175 mm. between the centre of the wheel hub and the centre of the steering relay, on each side (gauge 2307-T, see Pl. 113), the corrector being in the fully open position (valve towards the front).*

Pre-adjustment of the rear heights.

5 *The corrector control rod being free, position the arm so as to obtain a distance "c" = 35 mm. between the upper edge of the rubber buffer cup and the thrust face on the steel stop, the corrector being in the fully open position (valve towards the front).*

Adjustment of the heights.

Front: 225 ± 3 mm. from the underside of the anti-roll bar to the ground (the factory setting is 228 ± 10 mm.).

Rear: 335 + 10 mm. from the underside of the anti-roll bar to the ground.

Adjustment of the front anti-roll bar position.

16 *The distance "h" between the stop collar and the inner face of the fixing boss of the right ball joint should be 110 ± 0·5 mm.*

Adjustment of the front anti-roll bar bearing.

17 *The nuts of the "u" bolts fixing the bearings should be tightened to 9 ft.lbs. (1·2 m.kg.), the bar should turn under a load of 9 – 13 lbs. (4 to 6 kg.) applied on the ball joint.*

Adjustment of the lateral position of the front anti-roll bar.

18 *Shift the stop to the left in order to obtain a clearance of 0·5 to 1 mm.*

		TOOLS
	PRE-ADJUSTMENT OF THE FRONT HEIGHTS (see Pl. 79 and 80) :	
1	Connect the height control rod (20) to the connecting rod (19) of the corrector control. (The manual control lever should be placed in the "low" position)	7 mm spanner
2	Put the manual control lever in the "high" position. Make sure that the corrector valve is in the "fully open" position. (Check this by moving it towards the front, using a screwdriver).	
3	Untighten the locknut (36) on the adjusting screw and put the eccentric in the neutral position by turning on the screw (spanner 2285-T, see Pl. 64, fig. 5)	Spanner 2285-T

TOOLS

4 Put the gauges 2307-T (see Pl. 113) in position. The threaded rod (A) in the taper of the hub, the unthreaded rod (B) in the bore of the steering relay lever. With the aid of two jacks (one under each lower arm) raise the arm assemblies in order to bring the threaded gauge to dimension "n" = 175 mm from the relay gauge.

Make sure that there is about 1 mm clearance between the base of the control lever (19) and the corrector ball joint, if not, move the control rod (11). Tighten the clamp (12) of the control rod on the anti-roll bar.

Remove the gauges 2307-T ....

12 mm box spanner
Gauges 2307-T

PRE-ADJUSTMENT OF THE REAR HEIGHTS (see Pl. 82).

5 Position the two arms in a manner so as to obtain a dimension "c" = 35 mm between the upper edge of the front buffer and the lower edge of the stop (see Pl. 82, fig. 1).

6 Put the corrector in the "fully open" position. Tighten the clamp (12 mm box spanner or spanner 1677-T, see Pl. 54, fig. 4). ....

12 mm box spanner or spanner 1677-T

ADJUSTMENT OF THE HEIGHTS

In order to carry out this operation, the vehicle must be unladen and ready for the road (with spare wheel, tool kit and 1½ gallons (5 litres) petrol in the tank). Place the height control lever in the "normal" position (opposite the thick white line).

7 Check the tyre pressures :

Front : 165 x 400 X : 24 lbs. sq. in. (1.7 kg/cm^2).
Rear : 155 x 400 X : 20 lbs. sq. in. (1.4 kg/cm^2).

8 Remove the left-hand front wing.

Remove the left-hand protection panel ....

8-12-14 mm spanners and box spanners

9 Place the car on a lift or over a pit. Leave the engine idling. Release the parking brake. Do not place chocks under the wheels.

ADJUSTMENT OF THE FRONT HEIGHTS (see Pl. 79 and 80).

NOTE - The heights are adjusted at the factory to 228 ± 10 mm. During overhaul we recommend that the 225 ± 3 mm dimension should be adopted.

10 Slacken slightly the screw of the clamp (12) fixing the corrector control rod (11). Turn the clamp in the direction required to obtain an average height of 225 ± 3 mm, from the underside of the anti-roll bar to the ground. Rotate the clamp by small fractions of a turn. Rotating the clamp (12) towards the front increases the height of the car, while turning it towards the rear decreases the height. Retighten the screw of the clamp (12) (spanner 1677-T, see Pl. 54, fig. 4, for the screw with machined flats) ....

12 mm box spanner or spanner 1677-T

From the underside of the anti-roll bar to a level surface on which the wheels stand there should only be a difference in the heights of not more than 3 mm between the left and right-hand sides. If the difference is greater, work on the sleeve (15) of the anti-roll bar connecting rod.

11 Checking the front heights :

a) Place a straight-edge immediately underneath and parallel to the anti-roll bar with its ends resting on the edges of the lift or pit. The inner edge of the straight-edge must be in exactly the same plane as the surface on which the wheels rest.

b) Lift the car very slowly by means of the front bumper and stop as soon as resistance is felt and then hold the car in this position until a whistling noise, indicating the commencement of the exhaust of the hydraulic fluid, is heard.

NOTE - The time taken to raise the car should be at least 20 seconds.
At this precise moment get an assistant to measure the distance between the underside of the anti-roll bar (along the sidemember, right-hand side) and the bearing surface of the wheels (below the straight-edge mentioned in paragraph a).
Use a 50 cm. rule. In the same way measure the distance along the left-hand sidemember. Find the average of these two readings, for example: 245 mm.

c) Let the car stabilise itself.

d) Press the car down slowly by the front bumper, stop when resistance is felt. Wait in this position until a whistling noise is heard indicating the commencement of the inlet of hydraulic fluid. Have an assistant measure the distance between the underside of the anti-roll bar (along the right and left sidemembers) (see NOTE in paragraph b). Take the average of the two dimensions, for example: 210 mm.

e) Take the average of the two numbers given in paragraphs b) and d), for example :

$$\frac{245 + 210}{2} = 227.5 \text{ mm}$$

This average should be between 222 and 228 mm.

f) If this is not the case, carry out the operations mentioned in paragraphs 4 and 5.

ADJUSTMENT OF THE REAR HEIGHTS

12 Proceed in the same way as for the adjustment of the front heights (see paragraph 10).
The correct height is : $335 + {}^{10}_{0}$ mm between the underside of the anti-roll bar and the ground.

13 To check the rear heights proceed as follows :

a) Place the straight-edge immediately underneath and parallel to the anti-roll bar with its ends resting on the edges of the lift or the pit.

b) Remove the rubber grommet from the floor board, it will be found to the right of the exhaust pipe.

c) Raise the car very slowly by the rear bumper and stop when resistance is encountered. Hold the car in this position until a whistling noise, indicating the commencement of the exhaust of hydraulic fluid is heard.

NOTE - The time taken to raise the car must be at least 20 seconds. At this precise moment, get an assistant to measure the distance between the underside of the anti-roll bar and the surface on which the wheels rest.

TOOLS

(Insert the ruler through the hole in the floor board with the end of the ruler resting on the anti-roll bar), let us say this distance is 347 mm.

d) Allow the car to settle.

e) Press the car down slowly by the rear bumper, stop when resistance is felt. Wait in this position until a whistling noise is heard indicating the commencement of the inlet of hydraulic fluid. Have an assistant to measure the distance between the underside of the anti-roll bar and the surface on which the wheels stand, for example: 329 mm. Take the average of the dimensions, for example :

$$\frac{347 + 329}{2} = 338 \text{ mm.}$$

This average should be between 335 and 345 mm.

f) If this is not the case, carry out the operations mentioned in paragraph 12.

g) Put the rubber grommet in position in the floor board.

14 Check the front heights again and adjust if necessary.

15 Check the camber of the front wheels (fixture 2314-T, see Pl. 112).

The difference of the camber of the two front wheels should not be more than 1 mm, if so, adjust the sleeve (15) (see Pl. 79) .... 12-14 mm box spanners
Fixture 2314-T

ADJUSTMENTS OF THE FRONT ANTI-ROLL BARS

NOTE - On cars produced since June 1958, it is necessary to remove the anti-rattle springs in order to carry out the adjustments.

16 To adjust the lateral position of the anti-roll bar (see Pl. 80).

Place a straight-edge on the inner face of the right-hand ball pin boss, hold the straight-edge by hand and with a rule measure the distance "h" between the stop collar (25) and the outer edge of the straight-edge. If necessary shift the stop in the direction required in order that the distance "h" shall be equal to 110 ± 0.5 mm. Tighten the screw of the stop collar.

17 To adjust the anti-roll bar bearings (see Pl. 80).

To adjust the right-hand bearing :

1. Place the bearing (boss "i" not drilled) on the bar as indicated in fig. 3, hold it in this position and measure the gap "j" (see fig. 2) using a set of feelers. For example "j" = 1.80 mm.

NOTE - These bearings are assembled with a light tightening torsion.

Choose from among the shims sold by our Spare Parts Department those with a thickness equal to :

$$\frac{j - 0.2}{2} \text{ therefore, in the example above : } \frac{1.80 - 0.2}{2} = 0.8 \text{ mm.}$$

TOOLS

2. Fit the bearing. Fit the two shims determined above, between the cap and the bearing. Tighten the nuts of the "U" bolts to 9 ft. lbs (1.2 m. kg) (spring washer) .... 12 mm box spanner

3. Untighten the "U" bolts in order to turn the bar freely.

18 To adjust the anti-roll bar side clearances (see Pl. 80).

Place the right-hand stop (25) so that it rests on the right-hand bearing bushes (23) by pushing on the anti-roll bar.

Shift the left-hand stop (24) in the required direction to obtain a clearance "k" of 0.5 to 1 mm between the stop and the lower left-hand bearing bush.

19 To check the leverage required to turn the anti-roll bars.

Remove the bearing cap (16). Smear the bearings (23) with graphite grease.

Fit the bearing cap and tighten the fixing nuts to 9 ft. lbs (1.2 m. kg) (spring washers).

The anti-roll bar should turn under a load of 9-13 lbs (4 to 6 kg.) applied to the ball joint, if not, alter the thickness of the shims accordingly.

CHECKING A SUSPENSION CYLINDER FOR LEAKAGE

20 Place the cylinder complete with piston rod on the stand (stand 2239-T, see Pl. 134).

Fit the cap (L) and seal.

Engage the end of the rod in the socket on the stand.

Connect the cylinder feed pipe aperture on the cylinder to the aperture "a" on the pump using a pipe (B). .... Stand 2293-T

21 Tighten the bleed screw "b" of the test bench and operate the pump in order to raise the pressure to 570 p. s. i. (40 kg/cm^2).

Check the pressure gauge. It should not show a fall in pressure.

22 Lower the pressure by unscrewing the bleed screw "b".

Remove the pipe (B). Remove the cap (L). Remove the cylinder from the stand.

PARTICULAR POINTS

Replacement of a suspension sphere or a damper.

Refitting.

4 *Tighten the damper to 13 ft. lbs. (1·9 m.kg.). By hand screw the suspension sphere on the suspension cylinder, making sure that the number "59" stamped on the cap.*

Replacement of a height corrector.

14 *When fitted, push the corrector as far as possible in the slots towards the front and tighten the fixing screws. Make sure that there is a clearance of 1 mm. to 2 mm. between the ball joint of the corrector and the bottom of the control lever.*

16 *Check and adjust the heights.*

Replacement of a suspension cylinder.

32 *Make sure that the suspension sphere is marked "59" on the cap. On the left hand side make sure that a distance piece is fitted.*

REPLACEMENT OF A SUSPENSION SPHERE OR A DAMPER

		TOOLS
	Removal.	
1	Release the pressure in the suspension system by unscrewing the pressure control valve bleed screw. Place the manual height control lever in the "low" position	8 mm spanner
2	Remove the suspension sphere from the suspension cylinder (strap wrench 2223-T, see Pl. 87, fig. 1). Make sure that the distance piece on the left-hand side is removed together with the suspension sphere. Seal the aperture in the suspension cylinder (see Pl. 89)	Spanner 2223-T
3	Remove the distance piece from the suspension sphere (left-hand side) and remove the damper and the seals. Seal the suspension sphere aperture (see Pl. 89)	19 mm box spanner
	Refitting.	
4	Screw the damper into the suspension sphere, tightening it to 13 ft.lbs (1.9 m.kg). To do this, hold the suspension sphere tight and rotate the damper. When the suspension sphere slips the tightening torsion is correct. Connect the distance piece to the suspension sphere inserting a washer previously soaked in hydraulic fluid (left-hand side)	19 mm box spanner
5	Fit the suspension sphere on the suspension cylinder screwing it up by hand. Insert the seal previously soaked in hydraulic fluid.	
6	Build up the pressure in the suspension system and check the unions for leakage	8 mm spanner

REPLACEMENT OF A HEIGHT CORRECTOR

		TOOLS
	Removal (see Pl. 79).	
7	Jack up the front of the car (jacking bracket 2505-T, see Pl. 111). Remove the left-hand front wing and the wheel and the height corrector protection shield	Jacking bracket 2505-T 8-12-14 mm box spanners
8	Release the pressure in the suspension system by unscrewing the pressure control valve bleed screw. Set the manual height control lever in the "low" position	8 mm spanner
9	Disconnect the connections on the corrector in the following order : a) Overflow return pipe (7). b) Suspension cylinder feed pipe (8) (lower union). c) Corrector feed pipe (9) (upper front union). d) Outlet pipe (10) of the corrector (upper rear union). Connect this pipe at once to the union of the overflow return pipe (7) in order to avoid draining the reservoir (spanner 2221-T or 2219-T, see Pl.61, fig. 3). Seal the openings of the pipes and the corrector as each pipe is disconnected (see Pl. 89)	Spanner 2219-T or 2221-T
10	Remove the corrector and bracket assembly (spanner 1623-T, see Pl. 87, fig. 3). Remove the bracket from the corrector	Spanner 1623-T 12 mm box spanner
	Refitting (see Pl. 79 and 80).	
11	Fit the bracket on the corrector so that the part with the slots is on the side where there are two unions on the corrector. Tighten the fixing screws (spring washers under the heads)	12 mm box spanner
12	Place the corrector in position and insert the fixing screws without tightening them (plain and spring washers under the heads).	
13	Connect the pipes to the corrector in the following order : a) Outlet pipe (10) of the corrector. Tighten the union immediately (spanner 2221-T or 2219-T, see Pl. 61, fig. 3). b) The corrector feed pipe (9). c) The suspension cylinder feed pipe (8). d) Overflow return pipe (7)	Spanner 2221-T or 2219-T

		TOOLS
14	Push the corrector forwards as far as possible in the slots. Tighten the fixing screws (spanner 1623-T, see Pl. 87, fig. 3)	Spanner 1623-T
	Make sure that there is a clearance of between 1 and 2 mm between the corrector ball joint and the bottom of the control lever (see Pl. 80, fig. 1). If not, move the control rod (11) and re-tighten the clamp (12) on the anti-roll bar.	
15	Start the engine. Put the suspension system under pressure and check the unions for leakage. Refit the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 111). Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg)	8 mm spanner Jacking bracket 2505-T
16	Check and adjust the heights (see Op. ID 433-0).	
17	Fit the corrector protection shield. Fit the wing	8-12-14 mm box spanners

REPLACEMENT OF A SUSPENSION CYLINDER

Removal (see Pl. 79).

18	Remove the wing. Jack up the front of the car (jacking bracket 2505-T, see Pl. 111). Remove the wheel	Jacking bracket 2505-T
19	Release the pressure in the suspension system by unscrewing the pressure control valve bleed screw. Set the manual height control lever in the "low" position	8 mm spanner
20	Remove the suspension sphere from the suspension cylinder (strap wrench 2223-T, see Pl. 87, fig. 1). Make sure that the distance piece on the left-hand side is removed together with the suspension sphere. Seal the apertures in the suspension cylinder and in the suspension sphere (see Pl. 89)	Strap wrench 2223-T
21	Disconnect the feed pipe from the suspension cylinder (spanner 2221-T or 2219-T, see Pl. 61, fig. 3). Seal the openings of the pipe and the suspension cylinder (see Pl. 89)	Spanner 2221-T or 2219-T
22	Remove the side protection shield	8 mm box spanner
23	Remove the clips securing the dust cover (1) to the cylinder and the socket of the ball (2).	
	Drain off any liquid found in the dust cover. Disengage the dust cover from the piston bearing cap and from the cylinder, but leave it attached to the overflow return pipe.	
24	Withdraw the retaining pin (3) from the fixing holes in the socket of the ball (2) and withdraw the rod from the piston by lowering the axle arms as far as possible.	
25	Undo the locknut (4) and the pointed cylinder fixing screws (5). Remove the suspension cylinder	12 mm spanner and box spanner

		TOOLS
	Refitting (see Pl. 79).	
26	Place the suspension cylinder in position. Fit the dust cover (1) in position on the cylinder and fit the rubber ring on the dust cover, holding the cylinder with the hand.	
27	Position the cylinder so that the grooves are in line with the pointed fixing screws. Make sure that the overflow return connection on the dust cover is correctly positioned with respect to the nylon overflow return pipe.	
	Fit the Ligarex clip on the rubber ring (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
28	Put the suspension cylinder in position. Tighten the pointed fixing screws (5) moderately. Lock the locknuts (4)	12 mm spanner and box spanner
29	Place the piston rod (6) and the coupling pin (3) in position in the cylinder and in the lever socket by lowering the axle arms as far as possible. Make sure that the rubber ring is on the dust cover (1). Make sure that the ball (2) is in place. Engage the end of the coupling pin in the holes in the cup.	
30	Place the dust cover (1) in position on the cup of the ball (2). Fit the rubber ring.	
	Fit a Ligarex clip (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
31	Connect the feed pipe to the suspension cylinder. Tighten the union (spanner 2221-T or 2219-T, see Pl. 61, fig. 3).	Spanner 2221-T or 2219-T
32	Fit the suspension sphere and tighten by hand. Make sure that the distance piece on the left-hand side is in position on the suspension sphere.	
	NOTE - The front suspension spheres are marked with a number "59" stamped on the cap.	
33	Start the engine. Retighten the pressure control valve bleed screw and build up the pressure in the suspension system. Check the unions for leakage.	
34	Fit the side protection shield, the wheel and the wing.	
	Lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft. lbs (15 to 20 m. kg).	8-12-14 mm box spanners
	REPLACEMENT OF A DUST COVER OR A SUSPENSION CYLINDER PISTON ROD	
	Removal (see Pl. 79).	
35	Remove the wing. Jack up the front of the car (jacking bracket 2505-T, see Pl. 111). Remove the wheel	Jacking bracket 2505-T
36	Release the pressure in the suspension system by unscrewing the pressure control valve bleed screw.	
	Place the manual height control lever in the "low" position	8 mm spanner

		TOOLS
37	Remove the side protection shield	8 mm box spanner
38	Remove the clips securing the dust cover (1) to the cylinder and to the socket of the ball (2). Drain off any liquid found in the dust cover. Disengage the dust cover from the piston bearing cup and from the cylinder, but leave it attached to the overflow return pipe.	
39	Withdraw the coupling pin (3) from its fixing holes in the cup of the ball (2) and withdraw the rod from the piston by lowering the axle arms to the utmost extent.	
	Refitting (see Pl.79)	
40	Place the dust cover (1) in position on the cylinder and fit the rubber ring on the dust cover. Fit a Ligarex clip on the dust cover (pliers 2483-T, see Pl.17, fig.2)	Pliers 2483-T
41	Place the piston rod (6) and the coupling pin (3) in position in the cylinder and in the lever socket by lowering the axle arms to the utmost extent. Make sure that the rubber ring is on the dust cover (1). Make sure that the ball (2) is in position. Engage the ends of the coupling pin in the holes in the socket.	
42	Fit the dust cover (1) on the socket of the ball (2). Fit the rubber ring. Fit a Ligarex clip (pliers 2483-T, see Pl.17, fig 2)	Pliers 2483-T
43	Start the engine. Retighten the pressure control valve bleed screw and build up the pressure in the suspension system. Check the unions for leakage.	
44	Fit the side protection shield, the wheel and the wing. Lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg)	8-12-14 mm box spanners

PARTICULAR POINTS

Overhauling a front damper valve

These damper valves are marked with the letters "AV" stamped on the nuts.

3 *Fit the parts on the stud in the following order, commencing from the suspension sphere end, 1 nut, 1 valve (large diameter) 0·20 mm. thick, 1 valve (small diameter) 0·30 mm. thick, the damper body, 1 valve (large diameter) 0·30 mm. thick, 1 nut (tightening torsion 14 to 16 ft.lbs. (2 to 2·2 m.kg.).*

Overhauling a rear damper valve

These damper valves are marked with "ARI", stamped on the nuts.

6 *Fit the parts on the stud in the following order, commencing from the suspension sphere end; 1 nut, 1 valve (large diameter) 0·15 mm. thick, 1 valve (large diameter) 0·20 mm. thick, 2 valves (small diameter) 0·30 mm. thick, 1 nut (tightening torsion 14 to 16 ft.lbs. (2 to 2·2 m.kg.).*

Overhauling a suspension cylinder

10 *The seal retaining washer is paired with the piston. If either of these parts has to be renewed, it is necessary to fit a part of the same classification (a number is engraved on the edge of the retaining washer and stamped on the head of the piston).*

11 *In the case of slight scratches on the piston, it is permissible to polish lightly with abrasive paper No. 600.*

Overhauling a height corrector

16 *In the hole drilled in the body, parallel to the spindle, a steel wire will be found, this must not be removed when dismantling.*

TOOLS

OVERHAULING A FRONT DAMPER VALVE

NOTE - These damper valves are marked by the letters "AV' stamped on the nuts.

Dismantling (see Pl.79, fig.3).

1 Hold the damper valve in a vice by means of the nut (26) suspension sphere side. Remove the nut (27), remove the valve (28), the body (29) and the valves (30) and (31). Remove the nut (26) from the stud .... 19 mm box spanner

2 Clean the parts and blow with compressed air.

Assembly (see Pl.79, fig.3).

Screw nut (27) on the shortest threaded portion of the stud, until the face of the nut is flush with the end of the stud. Hold this assembly in a vice.

TOOLS

Fit the parts in the following order:

The valve (28), 0.30 mm thick
The damper body (29);
The valve (30), 0.03 mm thick;
The valve (31), 0.20 mm thick.

Tighten the nut (26) to 14 to 16 ft.lbs (2 to 2.2 m.kg) .... 19 mm box spanner

OVERHAULING A REAR DAMPER VALVE

NOTE - These damper valves are marked with "AR 1" stamped on the nuts.

Dismantling (see Pl.82, fig.3).

4 Hold the damper valve in a vice by the nut (38), suspension sphere side.
Remove the nut (9), the valves (39), the body (40) and the valves (41), (42) and (43). Remove the nut (38) .... 19 mm box spanner

5 Clean the parts and blow with compressed air.

Assembly (see Pl.82, fig.3)

6 Screw nut (27) on the shortest threaded portion of the stud, until the face of the nut is flush with the end of the stud. Hold this assembly in a vice.

Fit the parts in the following order:

The two valves (39), 0.30 mm thick;
The damper body (40);
The two valves (41), 0.03 mm thick;
The valve (42), 0.20 mm thick;
The valve (43), 0.15 mm thick.

Tighten the nut (9) to 14 to 16 ft.lbs (2 to 2.2 m.kg) .... 19 mm box spanner

OVERHAULING A SUSPENSION CYLINDER

Dismantling (see Pl.86).

7 To remove the piston (14) from the cylinder.

Hold the cylinder in a vice by the shoulder "b" with the nut upwards. Use the wooden jaws MR-3407-30 (see Pl.88, fig.3). Tighten the vice very moderately in order not to deform the cylinder. Remove the cup (15) retaining the felt seal (16) by means of a screwdriver or a chisel.
This cup is to be removed only if damaged. Remove the felt seal .... Wooden jaws MR-3407-30

TOOLS

8 Turn the cylinder and tighten the nut (17) in the vice, using wooden jaws MR-3407-30 (see Pl.88, fig.3).

Tighten the vice moderately, the nut being tightened only to 14 ft.lbs (2 m.kg).

Unscrew the cylinder from the nut (using a "C" spanner fitted on the feed union boss).

Remove the seal thrust washer (18) and the seal (19) .... Wooden jaws MR-3407-30

9 Carefully clean the parts. Blow with compressed air.

Assembly (see Pl.86)

10 Fit the felt seal retaining cup (15) on the nut (17) with a press (use a bush).
Fit the rubber seal (19) previously soaked in hydraulic fluid, in the seal thrust washer (18) .... Bush O.D. 60 mm
I.D. 44 mm, height 10 mm

IMPORTANT NOTE - The seal thrust washer (18) is paired with the piston (14). If either of these parts has to be renewed the cylinder-piston assembly must be replaced.

After immersion in hydraulic fluid, fit the felt seal (16) in the nut.

NOTE - The felt washer must be fitted only after it has been left to soak in hydraulic fluid for several hours.

Fit the thrust washer and seal assembly on the cylinder (see fig.3 for correct positioning).

Fit the nut (17) without tightening it.

11 Fit the piston.

NOTE - If there is only slight scoring, it is permissible to polish lightly with abrasive paper No.600.

Clean carefully and blow with compressed air.

Oil the piston (hydraulic fluid). Insert the piston in the cylinder.

12 Hold the cylinder in the vice by the nut (17) (wooden jaws MR-3407-30).

Tighten the vice moderately.

Tighten the cylinder on the nut to 14 ft.lbs (2 m.kg), using a "C" spanner gripping the feed union boss and a torsion spanner (torsion spanner 2472-T). This tightening torsion is of greatest importance. It must be adhered to in order to ensure perfect fitting of the joint thrust washer, and to prevent chattering of the piston in the cylinder or a serious leakage of fluid.

Do not drop the piston during this operation.

Make sure that the piston slides freely .... Wooden jaws MR-3407-30
Torsion spanner 2472-T

TOOLS

OVERHAULING A HEIGHT CORRECTOR

Dismantling (see Pl. 86).

13 To remove the steel cups (1) and (2) : blow compressed air through the overflow return pipe (A). If one of the cups remains in position, screw a plug D 391-63 (see Pl. 89) on the pipe opening nearest to the cup and disengage it by levering it off with a small screwdriver. Remove the plug.

14 Remove the nut (3) holding the front cup on the corrector.
Remove the steel cup (4), the rubber cup (5) and the inner steel cup (6).
Remove the slide valve and rear cup assembly .... 8 mm box spanner

15 Hold the control (7) in a vice and remove the locknut (8) from the control.
Remove the control. Withdraw the plain washer (9), the outer steel cup (10), the rubber cup (11) and the inner steel cup (12) .... 8 mm spanner

16 Clean the parts carefully and blow with compressed air.

NOTE - In the hole drilled in the body parallel to the spindle, there is a steel wire which must not be removed.

Assembly (see Pl.86).

To fit the front cups :

17 On the end of the slide valve (13) with the longer threaded portion place an inner steel cup(12), a rubber cup (11), previously immersed in hydraulic fluid, an outer steel cup (10) and the plain washer (9).

Screw up the valve control (7) and tighten to 3.6 ft.lbs (0.5 m.kg) (without distorting the steel cup). Fit the locknut (8) (the thinner nut) .... 8 mm spanner

18 Oil the slide valve (hydraulic fluid) and engage it in the body of the corrector (see illustration for correct position) with the control on the side nearest the return union (B).

19 On the other end of the slide valve, place an inner steel cup (6), the rubber cup (5), previously immersed in hydraulic fluid, and the outer steel cup (4).

Tighten the nut (3) to 1.8 ft.lbs (0.25 m.kg) .... 8 mm box spanner

20 Immerse the corrector in hydraulic fluid. Position the control (see fig. 1) by turning the valve and cup assembly. Fit the rubber cups (5) and (11) in position in the grooves in the corrector body.

Seal the unions and the overflow return pipe with plugs.

21 Remove the corrector from the fluid bath. Place the retaining cups (1) and (2) in position immediately: engage them by hand. Complete the fitting with a press (a slight pressure is sufficient) (mandrel MR-3045-80, see Pl. 88, fig. 1) .... Mandrel MR-3045-80

REPLACEMENT OF AN ANTI-ROLL BAR

		TOOLS
	Removal (see Pl. 79 and 80).	
1	Jack up the front of the car (jacking bracket 2505-T, see Pl. 111). Remove the front wheels, the spare wheel, the spare wheel support, the front wings and the side and lower protection panels	Jacking bracket 2505-T 8-12-14 mm box spanners
2	Release the pressure in the suspension system by unscrewing the pressure regulator bleed screw. Set the manual height control lever in the "low" position	8 mm spanner
3	Disconnect the corrector feed pipe (9) from the pressure distribution block. Disconnect the outlet pipe (10) from the 4-way return-to-reservoir union. Disconnect the corrector overflow pipe (7) from the corrector. Disconnect the front suspension feed pipe (8) from the 4-way union (cars manufactured after February 1958) or from the 3-way union (cars manufactured before February 1958) (spanner 2219-T or 2221-T, see Pl. 61, fig. 3). Seal the openings in the pipes, on the corrector and on the union as each pipe is disconnected (see Pl. 89)......	Spanner 2219-T or 2221-T
4	Unscrew the screw of the clamp (12) securing the corrector control rod (11) to the anti-roll bar. Unscrew the screws of the collars (14) of the anti-roll bar coupling sleeves (15). Unscrew the sleeves (15) in order to disconnect the anti-roll bar from the front half-axles	12 mm spanner and box spanner
5	Remove the corrector fixing screws and withdraw the corrector together with its support plate and the pipes disconnected under paragraph 3. Remove the height adjustment control rod (20)	12 mm box spanner 8 mm spanner
6	Remove the anti-rattle springs (cars produced after June 1958). Remove the "U" bolts (21) from the anti-roll bar bearings, remove the bearing caps (16), the adjusting washers (22) and the nylon bushes (23). Withdraw the anti-roll bar from the left-hand side of the car	12 mm box spanner
	Refitting (see Pl. 79 and 80).	
7	Adjust the anti-roll bar (see Op. ID 433-0).	
8	To connect the anti-roll bar to the half-axles: To connect the anti-roll bar sleeve (15). Engage a few threads of the sleeve (15) complete with its collars (14) on the connecting rod of the buffer bracket. Engage the thread of the sleeve on the anti-roll bar rod. Proceed in the same way on the other side. Screw up the right-hand and left-hand coupling sleeves sinultaneously in order to obtain a distance "l" = 198 mm on the right and 199 mm on the left between the centres of the ball joints of the anti-roll bar and of the buffer bracket. Tighten the collars. The slot in the collar must be in line with the slot in the sleeves	12 mm spanner and box spanner

		TOOLS
9	To fit the height corrector :	
	a) Engage the ball (18) of the corrector control rod (11) in the bore in the bearing cap (16).	
	b) Place the corrector and pipe assembly in position, connect the pipe (8) to the front suspension feed union, the outlet pipe (10) to the 4-way return-to-reservoir union and the corrector feed pipe (9) to the pressure distribution block and connect the overflow return pipe (7) to the corrector (spanner 1623-T, see Pl. 87, fig. 3)	Spanner 2219-T or 2221-T
	c) Fix the corrector, the ball joint engaged in the control lever (19). Tighten the screw (plain and spring washers under the head) (spanner 1623-T, see Pl. 87, fig. 3)	Spanner 1623-T
	d) Remove the height variation control rod (20)	7-8 mm spanners
10	Pre-adjust the heights (see Op. ID 433-0).	
11	Fit the front wheels, lower the car to the ground (jacking bracket 2505-T, see Pl. 111), and tighten the wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg)	Jacking bracket 2505-T
12	Put the suspension system under pressure and check the unions for leakage. Place the manual height control lever in the "normal" position (opposite the thick white line).	8 mm spanner
13	Bleed the brakes (see Op. ID 433-0), (for cars manufactured since February 1958).	
14	Adjust the heights (see Op. ID 433-0).	
15	Adjust the manual height control (see Op. ID 437-0).	
16	Fit the lateral and lower protection panels, the front wings, the spare wheel support and the spare wheel	8-12-14 mm box spanners
	REPLACEMENT OF THE ANTI-ROLL BAR BEARINGS	
	Removal (see Pl. 79 and 80).	
17	Jack up the front of the car (jacking bracket 2505-T, see Pl. 111).	
	Remove the spare wheel, the spare wheel support, the front wings, the front wheels and the side protection panels...	Jacking bracket 2505-T 8-12-14 mm box spanners
18	Unscrew the screws of the collars (14) of the anti-roll bar coupling sleeves (15). Unscrew the sleeves (15) in order to disconnect the anti-roll bar from the front half-axles	12 mm spanner and box spanner
19	Disconnect the "U" bolts (21) of the anti-roll bearings, remove the bearing caps (16), the adjusting washers (22) and the bearings (23)	12 mm box spanner

		TOOLS
	Refitting (see Pl. 79 and 80).	
20	Place each lower bearing (23) in its bearing block, the longer part on the engine side and insert the cotter in its housing. Rest the anti-roll bar on the bearing.	
21	Check the adjustment of lateral position of the anti-roll bar (see Op. ID 433-0) and make any necessary adjustments.	
22	Adjust the right-hand anti-roll bar bearing (see Op. ID 433-0).	
23	Check the side clearance of the anti-roll bar. It should be such that "k" = 0.05 mm between the stop (24) and the lower left-hand bearing (23), the right-hand stop (25) being in contact with the bearings of the right-hand bearing block. If necessary, shift the left-hand stop (24) to obtain the correct clearance	12 mm box spanner
24	Adjust the left-hand bearing (see Op. ID 433-0).	
25	Remove the bearing caps (16). Smear the bearing (23) with graphite grease and refit the bearing caps. Tighten the "U" bolt nuts to 8.5 ft.lbs (1.2 m.kg) (spring washers). Check the torque of the anti-roll bar: it must rotate under a force of 9 to 13 lbs (4 to 6 kg.) applied at the ball joint; if not, change the adjusting washers (22) of the bearings	12 mm box spanner
26	Connect the anti-roll bar to the front half-axles (see paragraph 8, this operation).	
27	Make the provisional height adjustments (see Op. ID 433-0).	
28	Refit the front wheels and lower the car to the ground (jacking bracket 2505-T, see Pl. 111). Tighten the wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg)	Jacking bracket 2505-T
29	Adjust the heights (see Op. ID 433-0).	
30	Fit the side protection panels, the front wings, the spare wheel support and the spare wheel	8-12-14 mm box spanners

PARTICULAR POINTS

9 Replacement of a height corrector.

Check the heights and adjust if necesary (see Op. ID 433–0).

Replacement of a suspension cylinder.

15-23 *The rod can only be removed or refitted on the buffer support when the hole for the connecting pin in the rod and in the buffer support are paralell, the axle arm being in its lowest position.*

19 *The rear suspension spheres are marked with the number "26" stamped on the cap, screw on to the suspension cylinder by hand.*

Replacement of a dust cover or a suspension cylinder piston rod.

See para. 15–23, above.

REPLACEMENT OF A HEIGHT CORRECTOR

Removal (see Pl. 81).

		TOOLS
1	Jack up the rear of the car (jacking bracket 2505-T, see Pl. 111). Remove the rear left-hand wing and the wheel. Remove the side protection plate	Jacking bracket 2505-T 8-14 mm box spanners
2	Release the pressure in the suspension system by unscrewing the pressure regulator bleed screw and set the manual height control lever in the "low" position	8 mm spanner
3	Disconnect the pipes from the corrector in the following order : a) The overflow return pipe (15). b) The corrector outlet pipe (16). Connect this pipe immediately to the union of the overflow return pipe (15) in order to prevent the fluid escaping. c) The corrector feed pipe (17). d) The pipe (18) connecting the corrector to the suspension cylinder (spanner 2221-T, or 2219-T, see Pl. 61, fig. 3). Seal the openings of the pipes and of the corrector (see Pl. 89)	Spanner 2221-T or 2219-T
4	Remove the corrector fixing screws. These screws are situated in front of the wheel arch inside the rear boot	12 mm box spanner

		TOOLS
	Refitting (see Pl. 81).	
5	Connect the pipes to the corrector in the following order : a) The connecting pipe (18) between the corrector and the suspension cylinder. b) The corrector feed pipe (17). c) The corrector outlet pipe (16). d) The overflow return pipe (15)	Spanner 2219-T or 2221-T
6	Fit and tighten the corrector fixing screws (spring washers under the heads)	12 mm box spanner
7	Start the engine. Put the suspension system under pressure. Check the unions for leakage.	8 mm spanner
8	Fit the wheel. Lower the car to the ground and tighten the wheel fixing screws to 108 to 144 ft. lbs (15 to 20 m. kg).	
9	Check the heights and adjust if necessary (see Op. ID 433-0).	
10	Fit the side protection plate and fit the wing	8-14 mm box spanners

REPLACEMENT OF A SUSPENSION CYLINDER

		TOOLS
	Removal (see Pl. 82).	
11	Jack up the rear of the car (jacking bracket 2505-T, see Pl. 111). Remove the wing and the rear wheel	Jacking bracket 2505-T 14 mm box spanner
12	Release the pressure in the suspension system by unscrewing the pressure control valve bleed screw. Set the manual height control lever in the "low" position	8 mm spanner
13	Disconnect the feed pipe (1) from the suspension cylinder (spanner 2221-T or 2219-T, see Pl. 61, fig. 3). Block the openings in the pipe and the control valve (see Pl. 89)	Spanner 2221-T or 2219-T
14	Remove the clips securing the dust cover (2) to the cylinder and to the overflow return pipe (3). If necessary drain off the fluid found in the dust cover. Disconnect the overflow return pipe (3) from the dust cover (2).	
15	To remove the piston rod (4) : a) Remove the coupling pin (5). b) Remove the clip securing the ball joint dust cover (6) to the buffer support lever (7). Withdraw the dust cover towards the rear.	

		TOOLS
	c) Disengage the piston rod (4) from the buffer support lever (7). The rod can be removed from the buffer support only if the holes for the connecting pin (5) are parallel.	
	d) Release the dust cover (2) from the suspension cylinder and remove the piston rod together with the dust covers (2) and (6).	
16	Remove the suspension sphere together with its damper (8) from the suspension cylinder (strap wrench 2223-T, see Pl.87, fig.1). Seal the suspension cylinder aperture (see Pl.89)	Strap wrench 2223-T
17	Remove the locking plate from the cylinder and withdraw the cylinder towards the front	8 mm box spanner
18	To strip the suspension sphere:	
	a) Remove the damper (8) and dismantle it. Make a note of the order and the position of assembly of the parts (see fig.3).	
	b) Carefully clean the parts in alcohol.	
	c) Do not remove the piston from the suspension cylinder	19 mm box spanner
	Refitting (see Pl.82).	
	NOTE - The rear suspension spheres are marked with a number "26" stamped on the cap.	
19	Assemble the damper (8). Adhere to the correct order and position of assembly of the parts (see fig.3). Tighten the nut (9) to 21.6 ft.lbs (3 m.kg) and fit the damper on the suspension sphere. Hold the suspension sphere firmly in the hand when tightening. The correct tightening torsion is reached when the sphere begins to slip.	
20	To prepare the piston rod (4):	
	a) Engage the dust cover (2) on the piston rod and position it so that the overflow return is at right angles to the holes provided for the connecting pin.	
	b) Place the dust cover (2) in position on the milled portion of the piston rod and fit the Ligarex clip (pliers 2483-T, see Pl.17, fig.2). Insert a flexible bush (10).	
	c) Engage the flexible bush (14) on the dust cap (2). Fit a Ligarex clip (pliers 2483-T, see Pl.17, fig.2).	
	d) Engage the ball joint dust cover (6) on the piston rod (4)	Pliers 2483-T
21	Fit the suspension cylinder in its support on the body. Fit the locking plate. Tighten the fixing screw (plain and spring washers under the heads)	8 mm box spanner
22	Fit the suspension sphere on the suspension cylinder. Tighten by hand.	
	Connect the feed pipe (1) to the suspension cylinder (spanner 2221-T or 2219-T, see Pl.61, fig.3)	Spanner 2219-T or 2221-T

		TOOLS
23	To fit the piston rod:	
	a) Carefully clean the front end of the suspension cylinder and of the piston as well as the dust cover (2) in alcohol.	
	b) With the arms in the lowest position, engage the piston rod (4) in the piston and then in the buffer support lever (7) with the overflow return connection on the dust cover (2) pointing upwards.	
	c) Make sure that the piston rod is properly seated on the ball (11). When raising the arm the piston must not be able to slip out of the buffer support lever.	
	d) Fit the ball joint dust cover (6). Bring the holes for the connecting pin in line. Fit the Ligarex clip and make sure that the flexible ring (12) is in place (pliers 2483-T, see Pl.17, fig.2)	Pliers 2483-T
	e) Fit the connecting pin (5), the longer leg must be in buffer support lever (7). Turn down the end of pin against the lever (7) (see fig.2).	
	f) Fit the rubber bush (13) on the overflow return pipe (3). Insert the overflow return pipe (3) in the connection on the dust cover (2). Fit the bush (13) and the Ligarex clip (pliers 2483-T, see Pl.17, fig.2)	Pliers 2483-T
	g) Fit the dust cover (2) on the suspension cylinder. Fit the flexible ring (14). Fit the Ligarex clip (pliers 2483-T, see Pl.17, fig.2)	Pliers 2483-T
24	Refit the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl.111)	Jacking bracket 2505-T
25	Start the engine. Put the suspension system under pressure and check the unions for leakage. Refit the rear wing	8 mm spanner 14 mm box spanner

REPLACEMENT OF A REAR SUSPENSION CYLINDER DUST COVER OR PISTON ROD

Removal (see Pl.82)

26	Jack up the rear of the car (jacking bracket 2505-T, see Pl.111). Remove the wing and the rear wheel	Jacking bracket 2505-T 14 mm box spanner
27	Release the pressure in the suspension system by unscrewing the pressure regulator bleed screw. Place the manual height control lever in the "low" position	8 mm box spanner
28	Remove the clips securing the dust cover (2) to the suspension cylinder and to the overflow return pipe (3). Drain off any fluid found in the dust cover; disconnect the overflow return pipe (3) from the dust cover (2).	

TOOLS

29 To remove the piston rod (4):

a) Remove the connecting pin (5).

b) Remove the fixing collar from the ball joint dust cover (6). Withdraw the dust cover (6) towards the rear.

c) Disconnect the piston rod (4) from the buffer support lever (7). The rod (4) can be released from the lever (7) only if the holes provided for the connecting pin (5) are parallel.

d) Release the dust cover (2) from the suspension cylinder and remove the piston rod (4) together with dust covers (2) and (6).

30 Remove the dust cover (6) from the piston rod (4).

Remove the clip securing the dust cover (2) to the piston rod (4) and remove the dust cover (2).

Refitting (see Pl.82).

31 To prepare the piston rod (4):

a) Engage the dust cover (2) on the piston rod and position it so that the overflow return connection is at right angles to the hole for the connecting pin. Place the dust cover (2) in position on the milled portion of the piston rod and fit the Ligarex clip (pliers 2483-T, see Pl.17, fig.2); insert a rubber bush (10) .... Pliers 2483-T

b) Engage the flexible bush (14) on the dust cover (2).
Place the ball joint dust cover (6) on the piston rod (4).

32 Fit the piston rod (see paragraph 23, this operation).

33 Fit the rear wheel and wing. Lower the car to the ground (jacking bracket 2505-T, see Pl.111) .... Jacking bracket 2505-T
14 mm box spanner

34 Retighten the pressure regulator bleed screw .... 8 mm spanner

PARTICULAR POINTS

Replacement of an anti-roll bar.

4 *The clearance between the anti-roll bar and the rear hub should be set equally on both sides.*

5-6 *Check and adjust the heights.*

Replacement of a corrector control rod.

11-13 *Check and adjust the heights.*

		TOOLS
	REPLACEMENT OF AN ANTI-ROLL BAR	
	Removal (see Pl.81).	
1	Release the pressure by unscrewing the pressure control valve bleed screw and set the manual height control lever in the "low" position. Jack up the rear of the car (jacking bracket 2505-T, see Pl.111)	8 mm spanner Jacking bracket 2505-T
2	Remove the rear corrector control protection panel (on ID "Confort" models the rear seat squab must also be removed)	8 mm box spanner
3	Disconnect the flange (9) of the rear corrector control rod (10) from the anti-roll bar. Remove the coupling flanges (11) from the anti-roll bar and withdraw the bar	12 mm spanner 12-19-21 mm box spanners
	Refitting (see Pl.81).	
4	Fit the anti-roll bar so that the clearance between the anti-roll bar and the rear hubs is the same on both sides. Fit the coupling flanges (11) and tighten the flange fixing nuts	9-21 mm box spanners
5	Remove the rear corrector side protection panel and make preliminary adjustment of the heights (see Op.ID 433-0)	8 mm spanner and box spanner
6	Adjust the heights (see Op.ID 433-0). Fit the corrector control protection panel and fit the corrector side protection panel	8 mm box spanner
	REPLACEMENT OF A CORRECTOR CONTROL ROD	
	Removal (see Pl.81).	
7	Release the pressure by unscrewing the pressure control valve bleed screw and set the manual height control lever in the "low" position	8 mm spanner

		TOOLS
8	Jack up the rear of the car (jacking bracket 2505-T, see Pl. 111). Remove the left-hand rear wing and wheel, the corrector control protection panel and the corrector side protection panel	Jacking bracket 2505-T 14 mm box spanner
9	Disconnect the flange (9) of the corrector control rod (10) from the anti-roll bar. Remove the nut (12) from the height adjusting control rod (13) and withdraw the corrector control rod (10). Remove the sleeve seal from the opening in the wheel arch and withdraw the corrector control rod (10) towards the outside of the car. Remove the sleeve from the control rod	7-8-12 mm box spanners
	Refitting (see Pl. 81).	
10	Engage the rubber sleeve on the control rod (10) and place the control rod in position. Fit the flange (9) on the anti-roll bar and connect the corrector control lever (14) to the height adjusting control rod (13). Screw on the fixing nuts without tightening them.	
11	Make the preliminary adjustment of the heights (Op. ID 433-0).	
12	Fit the rear wheel and the wing and lower the car to the ground (jacking bracket 2505-T, see Pl. 111)	Jacking bracket 2505-T 14 mm box spanner
13	Adjust the heights (see Op. ID 433-0).	
14	Fit the corrector control protection panel and the corrector side protection panel	8 mm box spanner

TOOLS

ADJUSTMENT (see Pl. 83).

1 Place the control lever in the "normal" position and adjust the control :

a) At the front select a hole "a" in the front connecting rod (20) so that the distance "b" is between 7.5 and 9 mm (see fig. 1). If necessary, move the quadrant (23) in its slots in order to obtain this measurement.

b) At the rear select a hole "a" in the rear connecting rod (21) so that the distance "d" should be between 8 and 9.5 mm (see fig. 2). If necessary obtain this distance by adjusting the socket (31).

2 With the control lever in the "low" position the distance "e" between the upper trimming on the sidemember and the ball of the control lever (22) must be between 10 and 15 mm (see fig. 1). If necessary, adjust the lever (22) to obtain this measurement.

3 To check the adjustment of the corrector control levers :

a) At the front make sure that there is a clearance "f" with the corrector at the bottom dead centre of the inlet stroke (lever 34 pushed forwards) and a clearance "g" with the corrector at the bottom dead centre of the outlet stroke (lever 34 pushed towards the rear).

If necessary, adjust the rod (20).

b) At the rear make sure that there is a clearance "h" with the corrector at the bottom dead centre of the inlet stroke (lever 35 pushed towards the front) and a clearance "i" with the corrector at the bottom dead centre of the outlet stroke (lever 35 pushed towards the rear).

If necessary, adjust the nuts (36) and (37).

4 Check the front and rear heights and adjust if necessary (see Op. ID 433-0).

PARTICULAR POINTS

Removal

5-7 *Remove the connecting rods from the front of the car (hole provided for the front connecting rod).*

Assembly

13-14 *Fit the quadrant in position, the fixing screws in the centre of the slots. Put the lever in the "normal" position.*

15 *To adjust the control (see Pl. 83).*

Distance "b" 7·5 to 9 mm., adjusted by selecting a hole "a" on the front connecting rod. If necessary move the quadrant in its slots.

Distance "d" = 8 to 9·5 mm., adjusted by selecting a hole "a" on the rear connecting rod. If necessary adjust the rear yoke (31)

Distance "c" 10 to 15 mm., (with the central lever in the low position) the dimension is taken between the sidemember and the knob of the control lever. If necessary adjust the lever.

16 *To check the adjustment of the corrector control levers:*

Make sure that there is a clearance between the nut of the control rod and the corrector control lever the slide valve being at the bottom of the inlet or outlet stroke. If necessary adjust the nuts on their rod.

		TOOLS
	REMOVAL (see Pl. 83).	
1	Jack up the left-hand side of the car.	
2	Remove the left-hand front and rear wings and wheels. Remove the side protection panels of the front and rear correctors	8-12-14 mm box spanners
3	Remove the pin from the spindle (19) coupling the front connecting rod (20) and the rear connecting rod (21) to the control lever. Remove the connecting rod and the spindle (19).	
4	Remove the screws securing the quadrant (23) on the side scuttle panel and release the quadrant.	
	Unscrew the nut (24) on the locking screw of the bell crank lever (25).	
	Remove the assembly of the lever (25) and quadrant (23). Disengage the lever (22) from the support (27) welded on the body.	8 mm box spanner
5	Unscrew the nut (28) and disconnect the front connecting rod (20) from the front torsion rod (29). Remove the connecting rod (20) and the sleeve seal (30)	8 mm box spanner
6	Remove the rivet securing the yoke (31) of the rear connecting rod to the torsion rod (32). Unscrew and remove the yoke (31).	

		TOOLS
7	Engage the front end of the rear connecting rod (21) in the hole provided for the front connecting rod. Remove the rear connecting rod (21) from the front of the car.	
8	Remove the lower closing panels from the left hand sidemember.	
	ASSEMBLY (see Pl. 83).	
9	Insert the rear connecting rod (21) through the hole provided for the front connecting rod, then (through the opening in the upper part of the sidemember) through the nylon bushes (33) and through the hole in the rear closing panel of the sidemember.	
10	Screw the yoke (31) on to the rear end of the rear connecting rod (21) until it is about half-way down the threaded portion of the rod. Connect the yoke (31) to the rear torsion rod (32). Insert the rivet temporarily.	
11	Fit the sleeve seal (30). Connect the front connecting rod (20) to the front torsion rod (29). Tighten the nut (28)	8 mm box spanner
12	Put the lever (25) in position on the steel support and engage the control lever (22) together with quadrant (23) in the socket of lever (25) and in the hole in the support plate (27).	
	Bring the front end of the lever (22) in contact with the side scuttle panel. Tighten the nut (24)	8 mm box spanner
13	Put the quadrant (23) in position and tighten the two fixing screws, the latter being in the centre of the slots of the quadrant (plain and spring washers under the heads).	
14	Set the control lever (22) in "normal" position (opposite the white line). Connect the front connecting rod (20) and the rear connecting rod (21) to the lever (25). Fit the fulcrum pin (19) which will pass through the third hole in each of the connecting rods.	
15	To adjust the control : a) At the front : select a hole "a" on the front connecting rod (20) such that the distance "b" lies between 7.5 and 9 mm (see fig. 1), if necessary move the quadrant (23) in its slots to obtain this distance. b) At the rear : select a hole "a" in the rear connecting rod (21) such that the distance "d" lies between 8 and 9.5 mm (see fig. 2), if necessary adjust the yoke (31) to obtain this distance. Fit the rivet. c) Fit the pin of the fulcrum (19) coupling the connection rods to the lever (25). Grease the parts of the rear connecting rod where it fits in the nylon bushes (33) (adhesive grease). Fit the lower sidemember closing panels.	

d) With the control lever (22) set in the "low" position the distance between the upper trimming of the sidemember and the knob of the control lever (22) must be between 10 and 15 mm (see fig.1).

If necessary, adjust the lever (22) to obtain this measurement.

16 To check the adjustment of the corrector control levers:

a) At the front: make sure that there is a clearance "f" with the corrector at the bottom dead centre of the inlet stroke (lever (34) pushed forwards) and a clearance "g" with the corrector at the bottom dead centre of the outlet stroke (lever (34) pushed back). If necessary, adjust the rod (20). Tighten the locknut.

b) At the rear: make sure that there is a clearance "h" with the corrector at the bottom dead centre of the inlet stroke (lever (35) pushed forwards) and a clearance of "i" with the corrector at the bottom dead centre of the outlet stroke (lever (35) pushed back). If necessary, adjust the nuts (36) and (37).

17 Fit the left hand front and rear wheels and wings. Lower the car to the ground. Tighten the wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg) .... 12-14 mm box spanners

18 Fit the side protection panels of the correctors .... 8 mm box spanner

PARTICULAR POINTS

Adjustment of the lateral position

3 *Distance "c" = 122·5 ± 2·5 mm. between the centreline of the lower relay lever and the centreline of the rack pressure pad cap (see Pl. 93).*

Alignment of the steering

5 *With the front of the car on stands (bearing caps not locked), turn the steering wheel to the right, then to the left and tighten the bearing cap fixing screws.*

Adjustment of the track

7 *Toe-in at the front 1 to 3 mm. adjusted by the sleeve on the right hand steering rod, (right hand wheel raised); 1/4 of a turn is equivalent to an alteration of the track by 1 mm. approx.*

Adjustment of the steering lock

12 *The lock should be set at* $42^{\circ}\,{}^{0}_{-1}$, *the left lock is adjusted by the end cap, and the right lock, by the stop screw of the left hand relay lever. After adjustment the tyres should not foul the protection panels.*

		TOOLS
	ADJUSTMENT OF THE LATERAL POSITION OF THE STEERING ASSEMBLY (see Pl.93).	
1	Jack up the front of the car (jacking bracket 2505-T, see Pl.111)	Jacking bracket 2505-T
2	Remove the cover of the instrument panel, unscrew the locking screw (4) of the collar (5) (see Pl.91) (spanner 1994-T, see Pl.91, fig.3).	
	Remove the fixing screws of the steering bearing caps	12 mm box spanner Spanner 1994-T
3	Adjust the steering assembly in its bearings so that the distance "c" = 122.5 ± 2.5 mm is obtained between the centreline of the lower relay lever and the centreline of the rack pressure pad cap.	
4	Fit the steering bearing caps, insert the fixing screws without tightening them (spring washers under the heads)	12 mm box spanner
	ADJUSTMENT OF THE ALIGNMENT OF THE STEERING ASSEMBLY (see Pl.91).	
5	After jacking up the front of the car and without locking the bearing cap screws, give the steering wheel several rapid turns first to the right and then to the left. Tighten the bearing cap fixing screws	12 mm box spanner

		TOOLS
6	Compress the spring (3) (spring compressor 1991-T, see Pl.91, fig.1). When the spring (3) is fully compressed, tighten the fixing screw (4) of the collar (5) (spanner 1994-T, see Pl.91, fig.3). Make sure that there is no play by alternately pulling and pushing the steering wheel. Refit the instrument panel cover, tighten the fixing screws (cup washers under the heads)	Spring compressor 1991-T Spanner 1994-T
	ADJUSTING THE TRACK (see Pl.90).	
	NOTE - The car must be at the normal height when this adjustment is made.	
7	Use one of the measuring rods of which several types are available on the market. At wheel axle height measure the distance between the wheel rims at the rear and mark the rims at the points where the measurement is taken. Rotate the wheels through half a turn and now measure the distance between the chalk marks at the front of the wheels. *The wheels must toe-in at the front.* The difference between the front and the rear measurements must be between 1 and 3 mm.	
8	In order to adjust the toe-in, jack up the front right hand side of the vehicle (jacking bracket 2505-T, see Pl.111). Unscrew the screws of the collars and turn the sleeve (34). Move it only through a fraction of a turn ($\frac{1}{4}$ turn is equivalent to an alteration of the track by 1 mm approx.)	Jacking bracket 2505-T 12 mm box spanner
9	Lower the car to the ground. Re-check the adjustment as indicated above. Position the collars so that the locking screw is opposite the slot in the sleeve at an angle of about 20°. Make sure that the steering arm ball pin is not under tension. Tighten the nuts of the collar fixing screws to 7.2 ft.lbs (1 m.kg). Turn the wheel from lock to lock to make sure that there is sufficient clearance between the fixing screws and the front crossmember or the radiator air intake cowl	12 mm box spanner
	ADJUSTMENT OF THE STEERING LOCK (see Pl.90).	
	NOTE - The steering lock must be adjusted 42° in order to avoid any abnormal strain on the driveshafts. After adjustment, the tyres should not touch the protection panels. The left hand steering lock is adjusted by means of the end cap (17) and the right hand steering lock by the stop screw (33).	
10	Remove the front wings	12-14 mm spanners and box spanners
11	Raise the front of the car, turn the steering wheel fully to one side and then lower the car to the ground.	
12	Adjust by turning the end cap (17) or the stop screw (33) according to which side is to be adjusted. Tighten the lock-nuts (16) and (37) (spanner 1854-T, see Pl.92, fig.4)	Spanner 1854-T

PARTICULAR POINTS

2 *Mark the position of the steering pinion (in relation to the flexible coupling, with a spot of paint opposite the slot in the coupling at "a" (see Pl. 90, fig. 3).*

9 *After assembly make sure that there is no play by alternately pulling and pushing on the steering wheel.*

		TOOLS
	REMOVAL (see Pl.91).	
1	Remove the battery and remove the battery tray	12 mm box spanner
2	With a dab of paint mark the position of the steering pinion opposite the slot in the steering coupling at "a" (see Pl.90, fig.3).	
3	Remove the instrument panel cover.	
4	Turn the steering wheel so that access can be had to the screw (4) of the fixing collar (5). Unscrew the screw (4) (spanner 1994-T, see Pl.91, fig.3)	Spanner 1994-T
5	Unscrew the nut of the screw (39) coupling the steering column to the flexible coupling (10) and remove the screw. Remove the steering column (see Pl.90, fig.3)	12 mm box spanner
6	Remove the conical cup (39), the steel cup (41), the spring (3), the steel cup (40) and the collar (5).	
	REFITTING (see Pl.91).	
7	On the steering column fit: the collar (5), the steel cup (40), the spring (3), the steel cup (41) and the conical cup (39). Fit the steering column in its bracket on the instrument board.	
8	Engage the steering column pinion in the flexible coupling (10), making sure that the mark (paint mark) is aligned with the slot in the coupling (at "a") (see Pl.90, fig.3). Insert the coupling screw (38) in the groove in the pinion and tighten the nut (insert a spring washer)	12 mm box spanner
9	Compress the spring (3) (compressor 1991-T, see Pl.91, fig.1). When the spring (3) is fully compressed tighten the screw (4) of the collar (5) (spanner 1994-T, see Pl.91, fig.3). Make sure that there is no play by alternately pulling and pushing on the steering wheel	Spring compressor 1991-T Spanner 1994-T
10	Fit the instrument panel cover. Tighten the fixing screws (cup washers under the heads).	
11	Fit the battery tray, fit and connect the battery	12 mm box spanner

PARTICULAR POINTS

Refitting

8 *Put the steering assembly in position, do not tighten the bearing cap fixing screws. Move the steering assembly, so that the dimension "c" = 122·5 ± 2·5 mm. between the centreline of the rack pressure pad cap and the centreline of the lower left hand relay lever (see Pl. 93).*

9 *Position the outer silentbloc bush of the left hand steering rod to give a dimension "d" 275 mm. from the centreline of the rack pressure pad cap, the arm of the steering wheel being in the horizontal position.*

11 *With the front of the car raised, turn the steering wheel to the right then to the left in order to position the steering in relation to the wheel. Tighten the bearing cap fixing screws.*

15 *Adjust the track and the steering lock (see* Op. ID 440–0*).*

		TOOLS
	REMOVAL (see Pl.90 and 91).	
1	Remove the spare wheel and the left front wing. Jack up the front of the car (jacking bracket 2505-T, see Pl.111) . . .	Jacking bracket 2505-T 12-14 mm spanners and box spanners
2	Remove the battery and the battery tray	12 mm box spanner
3	Remove the instrument panel cover. Unscrew the screw (4) of the collar (5) (spanner 1994-T, see Pl.91, fig.3)	Spanner 1994-T
4	Disconnect the flexible coupling (10) from the steering pinion (11)	12 mm box spanner
5	Disconnect the steering levers (1) from the relay shafts	14-16 mm box spanners
6	Remove the steering bearing caps	12 mm box spanner
7	Release the steering assembly and withdraw it from the left hand side of the car.	
	REFITTING (see Pl.90 and 91).	
8	Insert the steering assembly in position from the left hand side of the car.	
	Position the steering assembly in its bearings. Fit the bearing caps and insert the screws without tightening them (spring washers under the heads).	
	Position the steering assembly in its bearings so that the centreline of the rack pressure pad is at a distance of "c" = 122.5 ± 2.5 mm from the lower left relay lever (see Pl.93, fig.2).	
	Connect the steering levers (1) to the relay shafts. The nuts must be on the outside. Tighten the nuts to 18 ft.lbs (2.5 m.kg)	14-16 mm box spanners

		TOOLS
9	Rotate the steering pinion (11) until the outer bush (12) on the left hand steering arm rod flexible bush is at a distance of "d" = 275 mm from the centreline of the rack pressure pad cap (see Pl.93). NOTE - A difference of more than 1 mm will cause excessive play of the steering wheel arm.	
10	Set the arm of the steering wheel so that it is 30° below the horizontal, on the left hand side. Connect the flexible coupling (10) to the steering pinion (11). Compress the spring (3) (spring compressor 1991-T, see Pl.91, fig.1). When the spring is fully compressed tighten the screw (4) of the collar (5) (spanner 1994-T, see Pl.91, fig.3)	12 mm box spanner Spring compressor 1991-T Spanner 1994-T
11	Turn the steering wheel to make sure that the steering assembly and the steering wheel are correctly aligned Tighten the bearing cap fixing screws	12 mm box spanner
12	Make sure that there is no play by alternately pulling and pushing on the steering wheel.	
13	Fit the instrument panel cover.	
14	Fit the battery tray. Fit and connect the battery. Lower the car to the ground	12 mm box spanner
15	With the car at its normal height ("normal" position): a) Adjust the track (see Op.ID 440-0). b) Adjust the steering lock (see Op.ID 440-0).	
16	Fit the left hand front wing and the spare wheel	12-14 mm spanners and box spanners

PARTICULAR POINTS

Dismantling

8 *The ball joints on the steering rods cannot be dismantled, the complete rod must be changed.*

If the ball joints are in good condition, do not clean the rods by dipping them, otherwise the grease in the ball joints will be removed.

Assembly

10 *On the right hand steering rod, screw the sleeve the same distance on the rod and on the end with the ball pin so that the dimension "e" = 402 mm. between the centreline of the ball pin and the centreline of the silentbloc (see Pl. 90).*

11 *To adjust the pinion.*

With the parts perfectly clean and free from grease, the longitudinal clearance should be 0 to 0·03 mm. (pinion free, with no play), nut tightened to 36 ft.lbs. (5 m.kg.).

14 *Tighten the nut locking the rack ball pin to 50 ft.lbs. (7 m.kg.) lockwasher).*

17 *Tighten the nut locking the central shackle to 29 ft.lbs. (4 m.kg.), do not loosen in order to fit the split pin.*

TOOLS

DISMANTLING (see Pl. 90).

1 Hold the steering assembly in a vice (vice support 1999-T, see Pl. 93, fig. 1).

Remove the left-hand clip from the left-hand dust cover (13). Remove the cover to fix the vice support . . . .

Vice support 1999-T

2 To remove the steering rods and the central shackle :

Remove the nuts and the pins (14) and disconnect the rods from the central shackle (15).

Remove the nut and disconnect the central shackle (15) from the central ball pin (extractor 1967-T, see Pl. 92, fig. 2)

16-21-23 mm box spanners
Extractor 1967-T

3 To remove the central ball pin :

Unlock the locknut (16), remove the steering lock adjusting cap (17) and remove the locknut (16) (spanner 1854-T, see Pl. 92. fig. 4).

Turn the steering to the extreme left-hand side and lock the rack with the aid of the tongue of the vice support 1999-T (see Pl. 93, fig. 1) (the locking nut of the ball pin is tightened to 50 ft.lbs (7 m.kg) and if the ball pin bears on the housing the latter will be damaged).

Remove the housing sealing cap (18), the Ligarex clips on the dust covers, the right-hand dust cover (19), and the movable covers.

Remove the spring (20), the rubber spacer (21) and the guide bush (22).

Remove the locking piece of the nut (23) and remove the nut (socket 1987-T, see Pl. 92, fig. 3).

Remove the ball pin (24) from the rack (extractor 1966-T, see Pl. 92, fig. 1) . . . .

Spanner 1854-T
Socket 1987-T
Extractor 1966-T

		TOOLS
4	Remove the split pin from the pressure pad adjusting nut (25). Remove the nut (25) (spanner MR-3691-70, see Pl. 96, fig. 2), the spring (26) and the pressure pad (27).	
	Remove the rack	Spanner MR-3691-70
5	To remove the rack pinion :	
	Remove the steel cap (28). Remove the metal of the nut (29) from the groove in the pinion. Remove the nut (29). Remove the sealing cup (30).	
	Remove the pinion by tapping on the end with a bronze drift. Make sure that the balls of the bearing (31) do not scatter.	19 mm box spanner
6	Remove the distance piece (32). Drive out the outer race of the bearing (31) and the bearing (36).	
7	Remove the steering lock adjusting screw (33) and the locknut (37). Remove the left-hand dust cover (13)...........	12 mm box spanner
8	To strip the steering rod :	
	a) Remove the nuts. Disconnect the steering levers (1) from each rod (extractor 1964-T, with pressure pad 1968-T, see Pl. 64, fig. 2). Remove the rubber cups and the nylon cups.	
	b) Remove the sleeve (34) from the right-hand rod.	
	c) Remove the rubber bushes (35) with a press (mandrel MR-3676-110, see Pl. 92, fig. 5)	21 mm box spanner Extractor 1964-T Pressure pad 1968-T Mandrel MR-3676-110
	NOTE - The ball joints on the steering rods cannot be dismantled. The whole rod assembly must be changed. If the rod ball joints are in good condition do not clean the rods by dipping them, otherwise the grease in the ball joints will be removed.	
9	Remove the steering assembly from its support and clean the parts.	
	ASSEMBLY (see Pl. 90).	
10	To assemble the steering rods :	
	a) Put the rubber bushes (35) in position in the steering rod sockets, using a press (mandrel MR-3676-110, see Pl. 92, fig. 5). Make sure that the rubber bushes project equally on either side of the socket	Mandrel MR-3676-110
	b) On the right-hand steering rod, fit the adjusting sleeve (34) complete with its fixing collars with the retaining nipples engaged in the grooves in the collars. Screw equal portions of the sleeve on the steering rod and on the end carrying the ball joint so that the distance "e" between the centre line of the ball joint and the centre line of the silentbloc is equal to 402 mm. Screw up the collar nuts without tightening them.	

TOOLS

c) To connect the steering levers:
Pack a little adhesive grease in the annular space between the ball pin stem and the housing.
Fit the nylon cup. Carefully clean off all grease from the ball pin taper. Fit the rubber cup. Fit the lever (1) (There is one left hand lever and one right hand lever. Make sure they are fitted correctly).
Tighten the nut to 29 ft.lbs (4 m.kg) and insert a split pin .... Assembly 1998-T

11 To fit and adjust the pinion (see Pl.90 and 97).

NOTE - Before proceeding with this operation, remove all traces of grease from the parts.

a) Place the outer race of the bearing (31) in position, using a press.

b) Fit the lower bearing (36) in the steering assembly (observe the order of assembly). Fit the pinion without the balls of the rear bearing (31) and screw nut (29), after inserting an adjusting washer (32) (see Pl.90, fig. 3) *between the nut and the bearing.* Hold the pinion in a vice, and tighten moderately. Tighten the nut (29) to 36 ft.lbs (5 m.kg) (torsion spanner 2471-T, see Pl.7, fig.2) .... Torsion spanner 2471-T, 19 mm socket

c) Place the steering assembly on a support (vice support 1999-T, see Pl.93, fig.1), with the pinion down. Rotate the pinion by pulling it downwards, to enable the balls to be inserted.
Place a new 6 mm diameter ball (ball for the upper bearing 31)), in the centre hole in the end of the pinion, and fit the support 1997-T (provided with a dial gauge (2437-T) equipped with a flat probe), on the steering assembly (see Pl.97, fig.1). The dial gauge should be loaded by approximately 6 mm.
With the dial gauge probe resting against the ball in the end of the pinion, place the zero on the dial opposite the large pointer and note the position of the small pointer, for example between 7 and 8 .... Vice support 1999-T, Dial gauge support 1997-T, Dial gauge 2437-T

d) Remove the dial gauge support and the ball placed in the end of the pinion. Remove the steering from the support. Remove the nut (29) and the pinion.

e) Fit the pinion on a support (vice support 1999-T, see Pl.129, fig.1), with the pinion down. Place the pinion in a support (support 1996-T, see Pl.93, fig.3). Fit the 13 balls of the bearing (31) round the pinion.
The balls must be fitted dry.
Engage the pinion prepared in the manner described above, in the steering assembly. Release the pinion support.
Tighten the nut (29) so that the pinion rotates freely with no play .... Vice support 1999-T, Support 1996-T

f) Place the 6 mm diameter ball (used in paragraph c), in the centre hole in the end of the pinion, and fit the support 1997-T equipped with the dial gauge, on the steering assembly (see Pl.93, fig.2).
Place the small pointer in the position it had in paragraph c, then allow the probe to move against the ball in the end of the pinion, while counting the turns and fractions of a turn registered on the gauge. For example 4.28 mm.
Select an adjusting washer of the thickness determined above, from among those sold by our Spare Parts Department. In the example chosen, the washer No. DS 442-346 would be fitted .... Dial gauge support 1997-T, Dial gauge 2437-T

g) Remove the dial gauge support and the ball placed in the end of the pinion.
Remove the nut (29), the pinion and the balls of the bearing (31), from the steering assembly (use support 1996-T)

		TOOL
	h) Grease (with special bearing grease) the balls of the bearing (31) and the bearing (36). Place the adjusting washer (32) (see Pl.90, fig.3) on the pinion, with the chamfer facing the pinion. Grease the pinion (with special bearing grease) and insert it in the steering box. Hold the pinion in a vice, tightening it moderately. Tighten the nut (29) to 36 ft.lbs (5 m.kg) (Torsion spanner 2471-T, see Pl.7, fig.2)	Torsion spanner 2471-T 19 mm socket
	i) Ensure that the pinion rotates freely in the steering box, with no play. If there is some play, modify the thickness of the adjusting washer (32) accordingly.	
	j) Hold the end of the pinion and turn down the metal of the nut (29) into the groove in the pinion. Fit the cap (28) packed with grease (special bearing grease).	
12	To fit the rack (see Pl.90) Hold the steering in a vice (vice support, 1999-T, see Pl.93, fig.1). After engaging the rack on the pinion, fit the pressure pad (27), the spring (26) and the nut (25). Tighten the nut and then slacken it off 1/6 turn; check the operation of the rack. Drill a 2 mm hole in the housing (see fig.3) opposite one of the slots and lock the nut (25) with a split pin (spanner MR-3691-70, see Pl.96, fig.2)	Spanner MR-3691-70 Vice support 1999-T
13	Fit the left hand dust cover (13).	
14	To fit the central ball pin: a) Insert the ball pin (24) through the opening in the housing after first removing all grease from the ball pin taper.	
	b) Fit the guide bush (22) on the ball pin taper.	
	c) Tighten the tapers by tapping on the ball pin eye with a tube. Remove the guide bush (22). Fit the locking tab and tighten the nut (23) to 50 ft.lbs (7 m.kg) (socket 1987-2, see Pl.92, fig.3). Turn down the locking tab. During the tightening operation hold the rack by means of the tongue on the vice support 1999-T (see Pl.93, fig.1)	Vice support 1999-T
	d) Introduce 50 g. of adhesive grease through the opening in the housing for the ball pin, pinion side	Socket 1987-T
15	Put the rubber spacer (21) the spring (20) and the movable covers in position and engage the end thereof in the left hand dust cover (13). Fit the right hand dust cover (19) and engage it on the ends of the movable covers. Fit the Ligarex clips on the dust covers (pliers 2483-T, see Pl.17, fig.2)	Pliers 2483-T
16	Fit the right hand housing sealing cap (18), the locknut (16) (spanner 1854-T, see Pl.92, fig.4) and the left hand cap (17) Fit the steering lock adjusting screw (33) and its locknut but do not tighten	Spanner 1854-T 12 mm box spanner
17	Fit the central shackle (15) and the nut. Tighten the nut to 29 ft.lbs (4 m.kg). During this operation make sure that the shackle remains in parallel with the steering gear. Fit a split pin in the nut but never slacken the nut in order to insert the split pin	21 mm box spanner
18	Connect the steering rods to the central shackle (15) (see fig.4 for correct positioning). Engage the pins (14), tighten the nuts to 25 ft.lbs (3.5 m.kg) and lock with split pins	16 mm box spanner

PARTICULAR POINTS

Removal.

5 *Mark the position of the steering in the relay bearings, with a spot of paint (at "b" see Pl. 93), lower the steering and column assembly slightly before removing the relays.*

Assembly.

11 *This operation is only carried out when replacing the body, the front of the body or repairs to the body, it is then necessary to adjust the position of the relay assembly (see paragraph 11).*

If only replacing the relays, refit the adjusting washers found when dismantling.

13 *When refitting the steering, note the markings made when dismantling.*

16-17 *Adjust the track and the steering lock (see Op. ID 440–0).*

Replacement of a lower relay lever (on the car).

24 *Tightening of the nuts:*

Tightening the nut of the lower bearing and lock by hammering down the metal.

Tighten the nut of the upper bearing to 43 ft.lbs. (6 m.kg.) at the same time turning the relay spindle; loosen the nut and retighten to 14 to 22 ft.lbs. (2 to 3 m.kg.), lock the nut by hammering down the metal.

If the work has been made necessary because of seizure of the relay ball joint, check the operation of the other ball joint and the coupling levers on the pivot.

REPLACEMENT OF A STEERING RELAY

Removal (see Pl.91 and 94).

		TOOLS
1	Remove the spare wheel and the support	12 mm box spanner
2	Jack up the front of the car (jacking bracket 2505-T, see Pl.111). Remove the left hand front wing. Remove the front wheel on the side where the relay is to be replaced.	
3	Disconnect and remove the battery. Remove the battery tray	12 mm box spanner
4	Remove the instrument panel cover. Have the steering wheel turned so that the screw (4) of the collar (5) is in such a position that it can be unscrewed (see Pl.91). Unscrew the screw (spanner 1994-T, see Pl.91, fig.3)	Spanner 1994-T
5	Make a paint mark (at "b", see Pl. 93) to show the position of the steering assembly in its bearings.	

		TOOLS
6	Disconnect the steering lever (1) from the lower lever (42) of the relay to be replaced	14-16 mm box spanners
7	Remove the bearing caps. Lower the steering gear and steering column slowly in order to avoid damaging the steering wheel	12 mm box spanner
8	Disconnect the steering rod (43) from the pivoted lever (extractor 1964-T, with pressure pad 1968-T, see Pl.64, fig.2). Remove the rubber cup (44) and nylon cup (45)	21 mm box spanner Extractor 1964-T Pressure pad 1968-T
9	Remove the screw (46) securing the relay to the sidemember. Withdraw the relay and steering rod assembly. Do not lose the relay adjusting washers (48)	12 mm box spanner 26 mm ring spanner
	Refitting (see Pl.91 and 94).	
10	Put the relay and steering rod assembly in position. Fit the relay retaining pin (47) after first oiling. Fit the nut on the pin and screw up without tightening.	
11	To adjust the position of the relay (see Pl.95): NOTE - This operation is to be carried on only in the event of a replacement of the body, of the front body (front unit) or when assembling a body after repairs. The adjustment should be carried out before fitting the front half axles. If only the relays are replaced, refit the washers (48) found when dismantling. a) To determine the thickness of the washers to be fitted at "f". Since the tolerance for fitting the relay is ± 30, an accurate measuring gauge must be used (fixture 1995-T, see Pl.95). Position the gauge as indicated. Fit as many washers (48) as required between the relay fixing bracket and the sidemember	Fixture 1995-T
	b) With the washers (48) in position, tighten the screw (46) (spring washer under the nut). Tighten the nut of the pin (47). Check the adjustment (fixture 1995-T). Make any necessary changes in the thickness of the washers	12 mm box spanner 26 mm ring spanner
12	Connect the steering rod (43) to the pivoted lever. Insert the nylon cup and the rubber cup. Tighten the nut to 29 ft.lbs (4 m.kg) and lock with a split pin	21 mm box spanner
13	a) Insert the steering gear in its bearings in accordance with the paint mark made when dismantling (at "b" see Pl.93). Insert the bearing cap fixing screws (spring washers under the heads). b) Compress the spring (3) (spring compressor 1991-T, see Pl.91, fig.1). When the springs are fully compressed, tighten the screw (4) of the collar (5) (spanner 1994-T, see Pl.91, fig.3). Make sure that there is no play by pushing and pulling alternately on the steering wheel. Fit the instrument panel cover. Tighten the screws (cup washers under the heads)	Spring compressor 1991-T Spanner 1994-T

		TOOLS
	c) Turn the steering wheel in order to align the steering. Tighten the bearing cap fixing screws	12 mm box spanner
14	Fit the battery tray. Fit and connect the battery	12 mm box spanner
15	Fit the front wheels. Tighten the fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg). Lower the car to the ground (jacking bracket 2505-T, see Pl. 111)	Jacking bracket 2505-T
16	Adjust the track (see Op. ID 440-0).	
17	Adjust the steering lock (see Op. ID 440-0).	
18	Fit the left-hand front wing, the support and the spare wheel	12-14 mm spanners and box spanners
	REPLACEMENT OF A LOWER RELAY LEVER (on the car).	
	Removal (see Pl. 94).	
19	Remove the wing on the side where the work is to be done. Jack up the front of the car (jacking bracket 2505-T, see Pl. 111). Remove the wheel	Jacking bracket 2505-T
20	Disconnect the upper lever (1) from the relay shaft (42)	14-16 mm box spanners
	NOTE - If the left-hand lever is to be replaced, remove the battery, the tray and the bracket.	
21	To remove the relay shaft : a) Remove the rubber protector (49) of the lower nut. b) Force the locking metal of the nut inwards: use combination pliers. Remove the nut (50) (spanner 1989-T, see Pl. 96, fig. 1)	Spanner 1989-T
	c) Remove the relay lever assembly (42), the outer bearing bush (51) and the upper and lower bearing balls.	
22	Force the locking metal of the upper nut (52) inwards. Remove the upper nut (52) (spanner 1988-T, see Pl. 96, fig. 3). Remove the outer bush of the upper bearing	Spanner 1988-T
	Refitting (see Pl. 94).	
23	To fit the relay lever : a) On the new shaft fit: the rubber protection ring (49), the lower nut (50) complete with felt washer and the outer bush of the lower bearing (51).	

		TOOLS
	b) Grease (use Antar Cardrex E. P. or, failing this, use Compound grease) the lower groove of relay shaft. Insert 14 balls in this groove.	
	By means of the nut (50) hold the outer bearing bush (51) against the balls to keep them in position.	
	c) Still keeping the bush in contact with the balls by means of the nut, engage the shaft vertically in the housing.	
	Exert pressure on the bush by means of the nut in order to engage it in the bore in the housing and then remove the nut and complete the fitting of the bush, using the tube 1990-T (see Pl. 96, fig. 4).	
	Tighten the nut (50) (spanner 1989-T and lock it by turning down the metal)	Tube 1990-T Spanner 1989-T
	d) Fit the rubber protector ring (49).	
24	To fit the upper bearing :	
	a) Smear the outer bush of the upper bearing with grease (Antar Cardrex E. P. or, if unavailable, with Compound grease), and fit 14 balls in this race.	
	b) Place the race and balls in the housing.	
	c) Tighten the upper nut (52) with felt washer to 43 ft. lbs (6 m. kg). At the same time turn the lever (spanner 1988-T).	
	Slacken the nut and then re-tighten to a torque of 14 to 22 ft. lbs (2 to 3 m. kg). Lock the nut by turning down the metal	Spanner 1988-T
25	Connect the upper lever (1) to the relay shaft (42).	
	Tighten the nut to 18 ft. lbs (2. 5 m. kg)	14-16 mm box spanners
26	Fit the wheel. Lower the car to the ground. Tighten the wheel to 108 to 144 ft. lbs (15 to 20 m. kg). Fit the wing......	12-14 mm spanners and box spanners
	NOTE - If the work has been made necessary because of seizure of the relay, even at the limits of its movement, check the operation of the ball pin of the other relay shaft and the pivot steering levers.	

PARTICULAR POINTS

12 *On assembly, tighten the upper nut to 43 ft.lbs. (6 m.kg.) at the same time turning the lever to position the balls. Slacken the nut and then retighten to 14 to 22 ft.lbs. (2 to 3 m.kg.).*

If the work has been made necessary because of seizure of the relay, even at the limits of its movement, check the operation of the ball pin of the other relay shaft and the pivot steering levers.

		TOOLS
	DISMANTLING (see Pl. 94).	
1	Disengage the rubber bush (49).	
2	Force the metal locking the lower nut (50) inwards and remove the nut (spanner 1989-T, see Pl. 96, fig. 1)	Spanner 1989-T
3	Disengage the lower lever (42) and steering rod (43) assembly and the lower bearing race (51). Do not scatter the balls.	
	Remove the race (51), the lower nut (50) and the rubber bush (49) from the lever (42).	
4	Drive the metal locking the upper nut (52) inwards and remove the nut (spanner 1988-T, see Pl. 96, fig. 3)	Spanner 1988-T
5	Remove the upper bearing race (53).	
6	Clean the parts.	
	ASSEMBLY (see Pl. 94).	
7	Fit the upper bearing race (53). Put the upper nut (52) in position and screw up until the upper face is about 1 mm. from the upper face of the relay housing.	
	Introduce 20 g. of grease (Antar Cardrex E.P. or, if unavailable, Compound grease), into the relay housing.	
8	Put 14 balls into position and secure with grease in the upper ball race (53).	
9	On the lower lever (42) fit the rubber bush (49), the lower nut (50) and the lower bearing race (51).	

		TOOLS
10	Fix the lower lever (42) in the vice. Fit the bearing race (51) slightly below the lower groove in the lever and put 14 balls in position in the race and secure them with grease. Also use grease to hold lower nut (50) in position on the race (51). Place the race in position on the lever (the balls in their bearing groove).	
11	Keep the housing turned over and engage the lever (42) prepared as above vertically.	
	Hold the race (51) and screw up the nut (50). If necessary, use a tube to position the race in the relay housing (tube 1990-T, see Pl. 96, fig. 4).	
	Lock the nut (50) by turning down the metal. Place the rubber bush in position	Tube 1990-T
12	Tighten the upper nut (52) to 43 ft. lbs (6 m. kg) at the same time turning the lever (42) (spanner 1988-T, see Pl. 96, fig. 3).	
	Unscrew the nut and re-tighten to 14 to 22 ft. lbs (2 to 3 m. kg). Lock the nut by turning down the metal.	Spanner 1988-T
	NOTE - If the overhaul is necessary, because of seizure of the lower lever ball pin, even at the limits of its movement, check the operation of the other lower lever of the relay and the steering levers.	

PARTICULAR POINTS

Adjustment of a brake unit.

2 *Take up the clearance on the shoes, unscrew the screw locking the rear articulating pin and level the brake unit.*

3 *Adjust the height: the linings should stand proud of the disc at the front by approximately 1 mm.*

Centralising the rear brake shoes.

Use the fixture 2115–T. (see Pl. 106).

		TOOLS
	ADJUSTMENT OF A BRAKE UNIT (see Pl. 99 and 100).	
1	Operate the handbrake lever several times in order to take up the clearance of the shoes.	
2	To position the brake unit : a) Unscrew the screw (39) locking the pin (40) so that the latter can slide freely in the ball (43). NOTE - If the screw (39) is unscrewed too much there is danger of the thrust pad (42) slipping. b) Make sure that the slot in the ball is vertical. c) Apply the brakes by operating the handbrake lever and lock in this position. Tighten the screw (39) to lock the pin (40). d) Make sure that the end of the pin (40) is level with the inner face of the brake unit at "c" (see Pl. 99, fig. 2). Tighten the retaining screw (39) of the pin (40) to 28.8 ft.lbs (4 m.kg). e) Lock the screw (39) by means of a piece of wire threaded through the holes in the heads of the screw (39) and of the lower fixing screw (51) of the support (41), in order to prevent the screw from turning in the direction of unscrewing	14 mm box spanner
3	To adjust the height of the brake unit. Adjust the nuts of the front support rod (6) so that the linings stand proud slightly at the front of the brake disc by approximately 1 mm (see Pl. 99, fig. 1)	21 mm spanner and box spanner

TOOLS

CENTRALISING THE REAR BRAKE SHOES

Use the fixture 2115-T (see Pl. 106).

4 Setting to the diameter of the drum :

Place the fixture in the drum with the two dowels (A) engaged in the drum locating holes.

Keep the fixture flat against the drum web by means of two screws of 6 mm dia. by 1.00 pitch.

Describe a complete rotation with the pointer (B) and tighten the pointer fixing screw (C).

5 Adjustment of the brake shoes :

Position the fixture 2115-T on the hub with the hub lugs engaged in the holes in the fixture. Tighten the screw (D) in order to bring the device flat up against the brake drum bearing face on the hub.

Adjust the brake shoes by means of the adjusting cams so that the pointer (B) is flush with the linings round the whole periphery .... Fixture 2115-T

PARTICULAR POINTS

Replacement of the brake shoes.

Removal.

1 *In order to remove the left hand brake shoes it is necessary to remove the battery, battery tray and disengage the dynamo and the steel water pipe assembly.*

2 *Remove the brake shoes from the brake disc by turning with the spanner 2129–T towards the rear of the car.*

4 *The brake shoes should be replaced when the thickness of the linings is less than 3 mm.*

Replacement of a brake unit.

Removal.

11 *Remove the radiator and the front engine support crossmember.*

15 *If necessary, in order to remove the rear articulating spindle of the brake unit, use a screw 10 dia. 1·25 mm. pitch.*

Refitting.

21 *Adjustment of a brake unit (see paragraphs 8 and 9). Adjust the mechanical brake control cables (see Op. ID 454–0), bleed the brakes (see Op. ID 453–0).*

REPLACEMENT OF THE FRONT BRAKE SHOES

		TOOLS
	Removal (see Pl. 99 and 100).	
1	Jack up the front of the car (jacking bracket 2505-T, see Pl. 111)	Jacking bracket 2505-T
	NOTE - When replacing the brake shoes on the left-hand side, remove the battery and the battery tray; disconnect the dynamo support and place the dynamo against the water pump. Drain the radiator, disconnect the flexible water pipe from the radiator and disconnect the steel pipe	12 mm box spanner
2	To remove the brake shoes from the brake disc (see Pl. 101):	
	Put the fork 2128-T in position. Slightly tighten the screw in order to free the clearance take-up ratchet. Release the transmission sealing cover on the sidemember and insert the spanner and extension 2129-T in the hole "a" in the brake unit. Turn the spanner towards the rear of the car (clockwise for the left-hand brake unit and anti-clockwise for the right-hand brake unit).	
	IMPORTANT - When unscrewing the shoes make sure that they do not become wedged; the thrust rod which has been freed may engage on the handbrake control shaft, and the brake unit must then be completely dismantled.	
	Remove the spanner and extension and the fork	Fork 2128-T Spanner and extension 2129-T

		TOOLS
3	To remove the movable brake shoe block :	
	a) (*Cars produced before February 1958*)	
	Remove the split pin from the retaining pin (13) of the spring (14). Remove the pin (13) and the spring (14).	
	Release and remove the shoe (spanner 2127-T, see Pl. 101)	Spanner 2127-T
	b) (*Cars produced since February 1958*)	
	Proceed as indicated in paragraph 4.	
4	To remove the shoes from the brake unit.	
	Unscrew the locknut, unscrew the shoe locking screw (12) and disengage the assembly of the trunnion (11) and the screw (12).	
	Release and remove the shoe (spanner 2127-T, see Pl. 101)	7 mm spanner and box spanner Spanner 2127-T
	NOTE - Small cracks on the shoe linings are unimportant. The linings must be dry without any traces of oil. The shoes need be replaced only when the lining thickness is less than 3 mm.	
5	Refitting (see Pl. 99 and 100).	
	To fit the shoes on the brake unit.	
	Place the brake shoe in position.	
	Fit the trunnion (11) complete with screw (12) and locknut. Adjust the trunnion so that the point of the screw engages in the conical indent in the shoe.	
	Tighten the screw (12) and tighten the locknut	7 mm spanner and box spanner
6	To fit the movable brake shoe block :	
	a) (*Cars produced before February 1958*)	
	Place the brake shoe in position. Insert the pin (13) and the spring (14). If necessary adjust the pin (13) and insert the split pin	14 mm spanner
	b) (*Cars produced since February 1958*)	
	Proceed as indicated in paragraph 5.	
7	Operate the handle of the handbrake several times in order to take up the play of the shoes.	
8	To position the brake unit (see Pl. 99 and 100).	
	a) Unscrew the screw (39) locking the pin (40) so that the pin slides freely in the ball (43)	14 mm box spanner
	NOTE - If this screw is loosened too far, the thrust pad (42) may fall out of position.	
	b) Make sure that the ball slot is vertical.	
	c) Lock the brakes by operating the control lever (4). Tighten the screw (39) in order to lock the pin (40).	

		TOOLS
	d) Make sure that the end of the pin is level with the inner face of the unit at "c" (see fig.2). Lock the screw by means of a piece of wire inserted in the holes in the head of the screws (39 and 51) in order to prevent the screw from turning in an unscrewing direction.	
9	To adjust the height of the brake unit: Adjust the nuts and locknuts of the support rods (6) so that the linings stand proud slightly at the front of the brake disc by approximately 1 mm (see fig.1)	21 mm spanner and box spanner
10	Fit the wheel. Lower the car to the ground.	

REPLACEMENT OF A BRAKE UNIT

Removal (see Pl.99 and 100).

11	Drain the radiator. (Save the water which contains anti-freeze). Remove the radiator and the front engine support (see Op.ID.133-1).	
12	Remove the brake cooling duct. Remove the front brake connecting cable (1); disconnect the control cable from the levers (4 and 5) (carrier plate of the left hand brake)	12 mm spanner and box spanner
13	Remove the brake shoes (spanner 2127-T, see Pl.101, fig.2)	8 mm spanner and box spanner Spanner 2127-T
14	Disconnect the brake feed pipe and the front brake connection pipe (left hand brake unit) or disconnect the connection pipe (right hand brake unit) (spanner 2219-T or 2221-T, see Pl.61, fig.3). Seal the brake unit and pipe openings (see Pl.89)	Spanner 2219-T or 2221-T
15	Remove the retaining wire from the locking screw (39) of the ball (43). Loosen the screw (39) but do not undo it completely as otherwise the thrust pad (42) may fall out of position. Remove the split pin from the pin (40). Remove the fulcrum pin (40) from the brake unit. If necessary extract it using a screw of 10 mm dia. by 1.25 mm pitch	14 mm box spanner
16	Remove the brake unit by tipping it towards the front.	

Refitting (see Pl.99 and 100).

17	Place the brake unit in position and engage the pin (40) in the bore in the brake yoke and in the ball (43); make sure that the hole for the split pin is vertical.	
18	Connect the feed pipe and the front brake connecting pipe to the movable block (left hand brake unit) or connect the connecting pipe (right hand brake unit) (spanner 2221-T or 2219-T, see Pl.61, fig.3)	Spanner 2219-T or 2221-

		TOOLS
19	Fit the brake shoes (spanner 2127-T, see Pl.101, fig.2)	Spanner 2127-T
20	Fit the front brake connecting cable (1) and connect the control cable (3) to the lever (4 and 5) (left hand brake unit).	
21	Adjust the lateral position of the brake unit (see Op.ID.451-0).	
22	Fit the front engine crossmember support and the radiator (see Op.ID.133-1).	
23	Adjust the height of the brake unit (see Op.ID.451-0).	
24	Adjust the control cable and the connecting cable (see Op.ID.454-0).	
25	Refill the radiator with the engine running.	
26	Bleed the front brakes (see Op.ID.453-0).	

PARTICULAR POINTS

Dismantling.

13 *Use a 2 mm. dia. brass wire hook with a flattened end in order to remove the ring seals from the brake cylinders.*

14 *Do not use products which contain potash, which will attack aluminium, to clean the parts.*

Assembly.

15 *The pistons should show no sign of having been knocked or scratched, if so they should be replaced.*

16 *The adjustable thrust sleeves of the left-hand brake unit has a right hand thread and adjustable sleeve of the right-hand brake unit has a left-hand thread; do not interchange the parts.*

17 *The side clearance of the movable shoe – 0.2 to 0.3 mm. The side clearance of the mechanical control lever spindle = 0.5 mm. maximum.*

27 *On cars produced before February 1958, do not fit aluminium shoes, the movable shoe return springs must be fitted.*

	REMOVAL (see Pl. 99 and 100).	TOOLS
1	Draw back the movable block (15) as far as it will go. Insert the fork 2128-T in position and slightly slacken off the screw in order to release the pawl for taking up the clearance. Engage the spanner 2129-T on the hole "a" in the brake unit and turn the spanner clockwise (see Pl. 101) for the left-hand unit and anti-clockwise for the right-hand unit	Fork 2128-T Spanner 2129-T
2	To remove the brake shoes : a) On the brake carrier plate : Unscrew the locknut, unscrew the screw (12) and remove the trunnion (11) and screw. Remove the brake shoe (spanner 2127-T, see Pl. 101)	8 mm spanner and box spanner
	b) On the movable brake shoe block (*Cars produced before February 1958*) Remove the split pin and withdraw the pin (13) and the spring (14). Remove the shoe (spanner 2127-T, see Pl. 101).	Spanner 2127-T
	(*Cars produced since February 1958*) Proceed as indicated in paragraph a)	Spanner 2127-T
3	Remove the return spring (16) from the lever (4) (use one leg of the spring pliers 2110-T, see Pl. 61, fig. 3)	Spring pliers 2110-T
4	Remove the pipe and bleed screw assembly (on the right-hand brake unit) (spanner 2221-T or 2219-T, see Pl. 61, fig. 3).	Spanner 2219-T or 2221-T
5	Turn over the brake carrier plate. Remove the screw (17) from the thrust spring of the locking rod (18).	
	Remove the assembly comprising locking rod (18), guide bush (19), plunger (20), springs (21) and (22) and disc (23) (see Pl. 100, fig. 1).	
	Make sure that these small parts are not mislaid.	

		TOOLS
6	Turn over the brake carrier plate. Unscrew the locknut (24) and remove the fulcrum pin (25) of the ratchet (26). Remove the ratchet, the locknut and the plate fixing the bleed tube (50) (on right-hand carrier plate)	21 mm spanner
7	Remove the retaining pins (27) from the movable block return springs (28). (Pull on the springs with a steel wire hook). Let the spring return slowly in order to avoid scratching the ground faces of the block and the carrier plate. Remove the retaining bush (29) from the retaining pins (27) of the springs (28) (*Cars produced before February 1958*)	
8	Remove the locking screws (30) from the guide plates (31) of the movable block (15). Remove the guide plates (31) and the adjusting washers (32) from the movable block. Remove the movable block and spring assembly from above the carrier plate (hold the adjuster wheel (33) and the able adjustable thrust sleeves (34 and 35) against the fulcrum of the control lever (4)). Remove the adjuster wheel and adjustable sleeve assembly.	
9	Remove the circlip (36) from the fulcrum pin of the control lever (4) and remove the lower washer or washers (37). Remove the control lever (4) and the lever (5) (left-hand brake unit). Remove the control lever (4) and the cup between the lever and carrier plate (right-hand brake unit)	Circlip pliers
10	Remove the eccentric adjusting bush (8) from the control lever (4). Remove the retaining screw (38) from the return spring of the control lever (4)	10 mm box spanner
11	Unscrew the screw (39), withdraw the fulcrum pin (40) and the support (41). Remove the screw (39), the cup (42) and the ball (43) from the support (41).	
12	Drive out the needle bearings (44) from the brake carrier plate (mandrel with shoulder)	Shouldered mandrels : Small dia. = 19.5 x 50 long Large dia. = 25.5 x 150 long
13	To strip the movable brake shoe block : a) Remove the retaining pins (45) of the movable block return springs (28). Withdraw the springs (*Cars produced before February 1958*) b) Remove the piston push-rods (46) and remove the pistons (47). c) Remove the ring seals (48) from the cylinders (use hooks of 2 mm thick brass wire with flattened end). Be careful not to scratch the cylinder surfaces. d) Remove the circlips (49) from the piston push-rods (46).	
14	Clean all the parts thoroughly. Do not use any products containing potassium which will corrode the aluminium.	

ASSEMBLY (see Pl. 99 and 100).

15 To assemble the movable shoe (see Pl. 100, fig. 4 and 5).

a) Clean the movable shoe (15) and the pistons (47) in alcohol. Blow with compressed air.

b) After first moistening with hydraulic fluid, insert the ring seals (48) in the grooves in the cylinders of the movable shoe.

c) Fit the pistons (47) in the cylinders after moistening them with hydraulic fluid.

NOTE - The pistons must be completely free from scratches or dents. If not, refit new ones.

d) Fit the circlips (49) on the piston push-rods (46) and fit the rods (46) in the pistons (47).

16 To prepare the assembly for taking up the clearance (see Pl. 100, fig. 2 and 3).

a) Examine the adjuster wheel (33). Replace if the teeth are damaged.

b) Examine the adjustable thrust sleeves (34) and (35). Screw the male sleeve (34) into the female sleeve (35) as far as it will go. Smear the parts with graphite grease (graphite powder base grease and not a flake base).

NOTE - The left-hand brake unit sleeve has a right-hand thread while that for the right-hand brake unit has a left-hand thread marked by a groove on the smooth portion.

17 To prepare the brake carrier plate (see Pl. 99 and 100) :

a) Fit the needle bearings (44) after smearing with grease (bearing grease). (Use a mandrel with a shoulder).
The lower face of the upper bearing must stand proud about 0.3 mm from the bore "b" provided for the rod.
The upper face of the lower bearing must be 16 mm from the other bearing ....

Shouldered mandrel :
Small : 19.5 dia. x 50 long
Large: 25.5 dia.x 150 long

b) To adjust the lateral clearance of the movable brake shoe block (see Pl. 99, fig. 2).
Place the movable block (15) in position and hold it against the faces of the brake carrier plate.
Use a set of feeler gauges, measure the clearance between the movable block and the carrier plate, on the other face.
On each side of the movable block place a shim (32) selected from among those sold by our Spare Parts Department. These shims must give a clearance of between 0.2 and 0.25 mm.

c) To adjust the clearance on the mechanical control lever (see Pl. 99 and 100).
On the lever (4) place either the lever (5) (left-hand carrier plate) or the steel cup (right-hand carrier plate).
Engage the fulcrum pin of the lever (4) in the carrier plate. Fit a lower washer (37) and the circlip (36).
Push the fulcrum pin upwards and with a set of feeler gauges, measure the clearance between the lever (5) (left-hand carrier plate) or the steel cup (right-hand carrier plate) and the face of the carrier plate.

This clearance must be not more than 0.5 mm with the fulcrum pin turning freely.

To obtain this clearance place a washer (37) 0.5 mm thick between the circlip (36) and the lower washer........

Circlip pliers

18 Put the brake carrier plate in a vice (use soft jaws).

Fit the adjuster wheel (33) and the adjustable sleeves (34 and 35) on the carrier plate, the "wedge" of the push-rod in its housing on the fulcrum pin of the mechanical control lever (4).

Place the movable block (15) in position in the brake carrier plate. Use a small screwdriver to ease the various parts into position.

Fit the adjusting shims (32) whose thickness was determined according to paragraph 17b. Fit the guide plates (31). Tighten the screw (30) locking the plates (31).

19 Hold the movable block (15) horizontally against the carrier plate in the vice.

Engage the movable brake block return spring (28) and tighten the spring retaining screw (45) (*Cars produced before February 1958*)

Fit a spring pin retaining bush (29) in its housing in the brake carrier plate.
Pull on the spring (28) by its ring, using a steel wire hook.
Fit the retaining pin (27) of the spring (28).
Proceed in the same way for the other spring.

20 Fit the ratchet (26) on the brake carrier plate, insert the bleed tube retaining plate (50) (right-hand brake unit) between the locknut (24) and the carrier plate. Tighten the screw (25) and slightly slacken off. Tighten the locknut (24). The side clearance of the ratchet must then be between 0.03 and 0.05 mm .... 10 mm spanner and box spanner

21 Insert the locking rod (18) in its guide bush (19) after greasing the latter. In the bore provided in the locking rod fit the plunger (20) with the flat section on the spring side, the plunger spring (21), the plunger spring disc (23) and the locking rod spring (22).
All these parts must be lubricated with graphite grease before assembling.

Put the assembly in the carrier plate with the rounded part of the locking rod upwards and the ratchet located in the fork of the rod. Compress the spring and engage the thrust spring screw (17) in the brake carrier plate and in the hole in the guide bush. Tighten the screw.

22 Fit the eccentric adjusting stop (8) of the control lever. Insert the screw (spring washers).

Operate the control lever (4) several times in order to check the operation of the ratchet. The ratchet must always be flat against the adjusting wheel and the locking rod must always return properly after each tooth passes. If not, change the locking rod return spring and make sure that it slides easily in the guide bush.
Also check the joint of the ratchet lever.

23 To adjust the control lever eccentric adjusting stop :

a) After ensuring that the movable block is in contact with the carrier plate (operate the control lever in order to move the block forwards) make sure that the locking rod (18) is located in the hollow in a tooth. Insert the spanner 2129-T in the hole "a" in the carrier plate and make sure that it engages with the adjuster wheel (33). Turn the spanner to bring the tooth of the wheel flush against the locking rod. Maintain the pressure and move the control lever (4).

		TOOLS
	outwards (direction in which the lever would come into contact with the same tooth of the adjuster wheel as the locking rod (see Pl.100, fig.1). At this moment adjust the eccentric stop (8) so that for this position there is a clearance of 0.1 to 0.4 mm between the eccentric stop and the lever (4). Tighten the screw. Remove the spanner. Operate the control lever and make sure that for one complete stroke of the lever the ratchet travels one tooth of the adjusting wheel. Also make sure that the locking rod re-engages in the hollow in the wheel tooth, if not, readjust the eccentric stop (8).	
	Move the movable block (15) forward and withdraw it as far as possible (spanner 2129-T and fork 2128-T, see Pl.101). The block must abut against the carrier plate	Spanner 2129-T Fork 2128-T
24	Fix the retaining screw (38) of the control lever **return** spring (16).	
	Fit the return spring (16). Secure it to its retaining **screw** (38) and then to the trunnion on the lever (4) (use one arm of the spring pliers 2110-T, see Pl.103, fig.2)	Spring pliers 2110-T
25	Fit the pipe and bleed screw assembly (spanner 2119-T or 2221-T, see Pl.61, fig.3) on the right hand brake unit ...	Spanner 2119-T or 2221-T
26	Place the ball (43) in position in the support (41). Engage the pin (40) in the bore in the brake carrier plate and fit the ball and support assembly on the pin (40).	
	Place the cup (42) and the screw (39) in position.	
27	To fit the brake shoes (see Pl.100, fig.2).	
	a) On the brake carrier plate (all cars) and on the movable block *(Cars produced since February 1958)* Place the shoe in position. Fit the trunnion (11) and screw (12) assembly. Position the trunnion so that the point of the screw (12) engages in the conical dent machined in the shoe. Tighten the screw (12) and tighten the locknut.	8 mm spanner
	b) On the movable block *(Cars produced before February 1958)* Fit the shoes. Engage the pin (13) in the bore and put the spring (14) and the pin (13) in position. Raise the spring (14) with a screwdriver and push against the pin (13). Insert the split pin.	
	IMPORTANT NOTE - On cars produced before February 1958 aluminium shoes must in no circumstances be fitted on the movable block.	
	The movable block return springs (28) must be fitted.	

PARTICULAR POINTS

Replacement of the brake shoes.

11 *In order to ensure balanced braking, it is essential to replace the brake shoes on both rear wheels at the same time.*

Replacement of a rear brake backplate.

19 *In order to carry out this operation it is preferable to remove the half-axle (see OP. ID 420-1), so that the hub bearings can be fitted with a press when reassembling.*

24 *Fit the sealing ring at a distance of 4.5 mm. from the outside face of the axle arm.*

29 *Bleed the brakes (see OP. ID 453-0).*

REPLACEMENT OF A REAR BRAKE DRUM

		TOOLS
	Removal	
1	Jack up the rear of the car (jacking bracket 2505-T, see Pl.111)	Jacking bracket 2505-T
2	Remove the wing and the wheel	14 mm box spanner
3	Remove the drum fixing screws. Remove the drum.	
	Refitting (see Pl.102)	
4	Unscrew the locking nuts of the eccentric bushes (42). Turn down the locking piece. Centralise the brake shoes (fixture 2115-T, see Pl.106). Tighten the locknuts of the eccentric bushes (42). Turn down the locking piece	16 mm box spanner Fixture 2115-T
5	Place the drum in position on the hub. Lightly grease the face of the drum where it bears on the stub axle. Fit and tighten the brake drum fixing screws.	
6	Fit the wheel.	
7	Lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg). Fit the wing	14 mm box spanner

REPLACEMENT OF THE REAR BRAKE SHOES

		TOOLS
	Removal (see Pl.102).	
8	Jack up the rear of the car (jacking bracket 2505-T, see Pl.111). Remove the wing and the wheel. Remove the brake drum fixing screws. Remove the drum	Jacket bracket 2505-T
9	Unhook the brake shoe return springs (35) (spring pliers 2110-T, see Pl.103)	Spring pliers 2110-T
10	Remove the cups (36) from the thrust springs (37) by turning them through ¼ turn to release them from the rod. Hold the guide pins (38) with the spring pliers 2110-T (see Pl.103, fig.2)	Pliers 2110-T
11	Turn back the locking piece (41) and remove the nuts from the brake shoe anchor pins (40). Remove the locking piece (41) and remove the brake shoes together with the eccentric bushes (42). Remove the eccentric bushes (42) from the brake shoes	16 mm box spanner
	NOTE - In order to ensure balanced braking, it is essential to replace the brake shoes on both rear wheels at the same time.	
	Refitting (see Pl.102).	
12	Place the eccentric bushes (42) in position on the brake shoes. Fit the shoes on the brake plate, the shoe fitted with the longest lining being at the front. Fit the locking piece (41). Screw on the nuts without tightening them.	
13	Fit the guide pins (38), the thrust springs (37) and the cups (36). Lock the cups on their rod by turning them through ¼ turn (hold the guide pins (38) with the spring pliers 2110-T)	Pliers 2110-T
14	Attach the brake shoe return springs (35) (spring pliers 2110-T, see Pl.103)	Pliers 2110-T
15	Centralise the brake shoes (fixture 2115-T, see Pl.106)	Fixture 2115-T
16	Fit the brake drum. Lightly grease the bearing face on the hub. Tighten the brake drum fixing screws.	
17	Fit the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl.111) and tighten the wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg). Fit the rear wing	Jacking bracket 2505-T 14 mm box spanner

REPLACEMENT OF A REAR BRAKE BACKPLATE

		TOOLS
	Removal (see Pl.102).	
18	Jack up the rear of the car (jacking bracket 2505-T, see Pl.111). Remove the wing and the wheel	Jacking bracket 2505-T 14 mm box spanner
19	To remove the wheel hub (see Pl.70)	
	NOTE - In order to carry out this operation it is preferable to remove the half-axle (see Op.ID.420-1) so that the bearings (20) and (22) can be fitted with the press when re-assembling.	
	a) If the half-axle has been removed, put it on a stand (stand MR-3053-90, see Pl.73)	Stand MR-3053-90
	b) Remove the sealing cap (17). Lock the brake drum by tightening the brake shoe adjusting cams and remove the nut (18), the locking piece and the thrust washer (19)	36 mm box spanner
	c) Slacken off the brake shoe adjusting cams and remove the drum, after marking its position on the stub.	
	d) Remove the stub axle (extractor 2018-T, see Pl.74)	Extractor 2018-T
	e) Remove the sealing bush (26), the distance piece (21) and the adjusting washer (50) if fitted.	
20	Disconnect the rear brake articulating piping from the wheel cylinder (spanner 2219-T or 2221-T, see Pl.61, fig.3). Seal the apertures of the wheel cylinder and of the articulating piping (see Pl.89). Remove the brake backplate (spanner 1677-T, see Pl.54, fig.4)	Spanner 2219-T or 2221-T Spanner 1677-T
21	To strip the brake backplate (see Pl.102):	
	a) Remove the brake shoe return spring (35) (spring pliers 2110-T, see Pl.103)	Pliers 2110-T
	b) Remove the cups (36) by rotating them through ¼ turn to release them from the guide pin, remove the spring (37) and the guide pins (38).	
	c) Remove the nuts from the brake shoe anchor pins (40), the locking piece (41), the brake shoes and the eccentric bushes (42). Drive out the anchor pins (40) from the brake plate	21 mm box spanner
	d) Remove the wheel cylinder	12 mm box spanner
	e) Remove the rivets and remove the brake shoe adjusting cams (48) (block MR-3354-40, see Pl.105)	Block MR-3354-40
	Refitting (see Pl.102).	
22	To assemble the brake backplate:	
	a) Fit the brake shoe adjusting cams (48) and rivet the pins (block MR-3354-40, see Pl.105)	Block MR-3354-40
	b) Fit the anchor pins (40) using a bronze drift.	
	c) Fit the wheel cylinder (spring washers under the heads of the fixing screws)	12 mm box spanner

		TOOLS
	d) Fit the eccentric bushes (42) on the shoes. Place the shoes in position on the anchor pins (40), first oiling lightly. Fit the locking piece (41) and screw on the nuts without tightening them.	
	e) Fit the guide pins (38), the springs (37) and the cups (36), rotating them through a ¼ turn to secure them on the guide pins.	
	f) Fit the brake shoe return springs (35) (spring pliers 2110-T, see Pl. 103)	Pliers 2110-T
23	Fit the brake backplate. Tighten the fixing screws (spring washers under the heads) (spanner 1677-T, see Pl. 54, fig. 4). Connect the articulating piping to the wheel cylinder (spanner 2219-T or 2221-T, see Pl. 61, fig. 3)	Spanner 1677-T Spanner 2219-T or 2221-T
24	Fit the distance piece (21) and the adjusting washer (50) found when dismantling (see Pl. 70). Fit the sealing ring (26) at a distance of "b" = 4.5 mm from the outer face of the axle arm. Make sure that the bearing surface of the sealing ring on the bearing stop (30) of the bearing (22) is not burred or marked. If it is, it must be replaced.	
25	Place the hub in position and fit the bearings (20) and (22). Fit the thrust washer (19) and the locking piece. Tighten the nut (18). Fit the sealing cap (17)	36 mm box spanner
26	Centralise the brake shoes by adjusting the eccentric bushes and the cams (fixture 2115-T, see Pl. 106). Lock the brake shoe anchor pin nuts and turn down the locking piece	Fixture 2115-T 21 mm box spanner
27	Fit the half-axle on the car if it was removed (see Op. ID 420-1).	
28	Fit the brake drum in the position marked during dismantling. Fit the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 111), and tighten the wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg). Fit the wing	Jacking bracket 2505-T 14 mm box spanner
29	Bleed the rear brakes (see Op. ID 453-0).	

REPLACEMENT OF A WHEEL CYLINDER

Removal.

30	Jack up the rear of the car (jacking bracket 2505-T, see Pl. 111). Remove the wing and the wheel. Remove the brake drum fixing screws. Remove the drum, after marking its position on the stub..............................	Jacking bracket 2505-T
31	Disconnect the wheel cylinder feed pipe (spanner 2219-T or 2221-T, see Pl. 61, fig. 3). Seal the openings in the cylinder and the feed pipe (see Pl. 89)	Spanner 2219-T or 2221-T
32	Unhook the return spring from the brake shoes (spring pliers 2110-T, see Pl. 103)	Pliers 2110-T

		TOOLS
33	Remove the wheel cylinder fixing screws and remove the cylinder	12 mm box spanner
34	To dismantle the wheel cylinder (see Pl. 102): Remove the bleed screw, the dust cups (45), the pistons (46) and the circlip (47). Remove the ring seals (49) from the piston (46). Use a brass wire flattened at one end	10 mm box spanner
	To re-assemble the wheel cylinder (see Pl. 102) :	
35	Clean the parts. Use only alcohol. Fit the circlip (47). Fit the ring seals (49) on the pistons (46). Immerse the pistons (46) in brake liquid and insert them in the wheel cylinder, see that they are neither scored nor show traces of seizing. Fit the dust caps (45) and the bleed screw	10 mm box spanner
36	Fit the wheel cylinder on the brake backplate. Tighten the fixing screws (spring washers under the heads)	12 mm box spanner
37	Attach the brake shoe return springs (spring pliers 2110-T, see Pl. 103)	Pliers 2110-T
38	Connect the feed pipe to the wheel cylinder. Tighten the union moderately (spanner 2219-T or 2221-T, see Pl. 61, fig. 3)	Spanner 2219-T or 2221-T
39	Bleed the brake system (see Op. ID 453-0).	
40	Lightly grease the bearing face on the hub. Fit the brake drum in the position marked during dismantling. Tighten the fixing screws.	
41	Fit the wheel.	
42	Lower the car to the ground (jacking bracket 2505-T, see Pl. 111). Tighten the fixing screws to 108 to 144 ft. lbs (15 to 20 m. kg) Fit the wing	Jacking bracket 2505-T 14 mm box spanner

PARTICULAR POINTS

Bleeding the brake system:

On cars produced after February 1958, bleed the brake system with the engine idling and the car stabilised at its normal position.

Firstly: Bleed the brake system. Secondly: Bleed the master cylinder (see Paragraphs 7 and 8).

Adjusting pedal height :

Set the distance 'a' to 156–0.5 mm. by adjusting the screw (3) (see Pl. 107).

TOOLS

BLEEDING (cars produced until February 1958).

1 Fill the reservoir with brake fluid and check the level in order to top up as and when required.

2 Fit a piece of flexible tubing on the front brake cylinder bleed tube (this is to be found on the right-hand brake).
Place the other end of the flexible tube in a container, preferably a transparent one, containing a small quantity of special brake fluid.

3 Unscrew the bleed screw (spanner 2141-T, see Pl. 102, fig. 4).

Get an assistant to operate the brake pedal. For each stroke of the brake pedal a certain amount of liquid will be discharged from the flexible pipe and will contain bubbles of air driven out of the system.

Continue to operate the pedal until the fluid is free from bubbles.

As soon as the fluid is free from air bubbles tighten the bleed screw still keeping the brake pedal under pressure and the end of the flexible pipe in the fluid.

Remove the flexible tubing from the brake cylinder bleed tube .... Spanner 2141-T

4 Jack up the front of the car (jacking bracket 2505-T, see Pl. 111).
Take off the rubber protector caps from the rear brake cylinder bleed screws and proceed as above for the right-hand rear brake cylinder and then for the left-hand rear cylinder.
Do not forget to top up the reservoir (special brake fluid only) .... 10 mm spanner
Jacking bracket 2505-T

5 To check for leaks.
Press on the pedal as hard as possible for about 30 seconds to one minute. If the pedal offers resistance, there is no leakage. If, on the other hand, the pedal descends more or less rapidly, there is a leakage either at the union or in a pipe.
Check the reservoir as well: if the fluid level has fallen then the master cylinder sealing cup is leaking. This unit must then be overhauled immediately (see Op. ID 453-3).

6 Lower the car to the ground.
NOTE - On the market there are pressure devices by means of which continuous bleeding can be carried out and which give good results. Their use is recommended.

TOOLS

BLEEDING (cars produced since February 1958).

On cars produced since February 1958, the brakes must be bled with the engine idling and the car stabilised at its "normal" position.

7 To bleed the system:

a) To bleed the front brakes :

1. Fit a flexible pipe on the bleed tube of the front brake cylinders (this will be found on the right-hand brake). The end of the flexible pipe must be inserted in a container, preferably a transparent one, containing a small quantity of brake fluid.
2. Unscrew the brake bleed screw (spanner 2141-T, see Pl. 101, fig. 4).
3. Depress the brake pedal a full stroke and keep it depressed.
4. Bleeding occurs by the circulation of the fluid through the suspension system. When the fluid flowing from the pipe is free from air bubbles, re-tighten the brake bleed screw (spanner 2141-T).

b) To bleed the rear brakes :

Proceed in the same manner as indicated in the previous paragraph, working in succession on the left-hand and then on the right-hand bleed screws .... Spanner 2141-T

8 To bleed the master cylinder :

Unscrew the front brake bleed screw. Operate the brake pedal several times and re-tighten the bleed screw when the fluid discharged is free from air bubbles (spanner 2141-T, see Pl. 101, fig. 4) .... Spanner 2141-T

NOTE - When the supplementary feed operates in a permanent manner during the use of the brakes, bleeding must be carried out and the adjustment of the rear brake eccentric bushes must be checked.

ADJUSTING BRAKE PEDAL HEIGHT

9 Set the adjusting screw (3), so that distance "a" = $156^{\,0}_{-0.5}$ mm, from the lower edge of the brake pedal pad (rubber pad removed) to the top of the underfelt, underneath the rubber mat (see Pl. 107).

PARTICULAR POINTS

Replacement of a pedal gear.

19 *Pedal heights (see Pl. 107):*

Brake pedal, dimension 'a' 156 – 0.5 mm. from the underside of the pedal pad (rubber pad removed) to the top of the felt mat underneath the rubber mat.

Clutch pedal, dimension 'b' 148 $^{5}_{0}$ mm. measured in the same manner as for the brake pedal.

REPLACEMENT OF A MASTER CYLINDER

		TOOLS
	Removal.	
1	Insert a 10 mm drift with a tapered end in the brake fluid reservoir aperture in order to stop the flow of the fluid after the removal of the master cylinder. In the case of cars produced since February 1958 release the pressure by unscrewing the control valve bleed screw and set the manual height control lever in the "low" position	Tapered drift : Small end dia. = 6 mm Large end dia. = 10 mm Length of taper = 25mm 8 mm spanner
2	Disconnect the master cylinder feed pipe or pipes	14 mm spanner
3	Disconnect the front brake connecting pipe from the master cylinder (spanner 2219-T or 2221-T, see Pl. 61, fig. 3). Slightly slacken the front union on the master cylinder (cars produced until February 1958)	Spanner 2219-T or 2221-T 19 mm box spanner
4	Disconnect the rear brake connecting pipe from the master cylinder (spanner 2221-T or 2219-T, see Pl. 61, fig. 3).	Spanner 2219-T or 2221-T
5	Remove the fixing nuts and remove the master cylinder from its bracket	12 mm box spanner 12 mm ring spanner
	Refitting.	
6	Fit the master cylinder on its bracket and tighten the fixing nuts (insert a spring washer)	12 mm box spanner 12 mm ring spanner
7	Connect the rear brake connecting pipe to the master cylinder union (spanner 2219-T or 2221-T). Tighten the front union on the master cylinder (cars delivered until February 1958)	Spanner 2219-T or 2221-T 19 mm box spanner

		TOOLS
8	Connect the front brake connecting pipe to the master cylinder union (spanner 2219-T or 2221-T, see Pl. 61, fig. 3).	Spanner 2219-T or 2221-T
9	Connect the feed pipe or pipes to the master cylinder. Remove the drift from the brake fluid reservoir	14 mm spanner
10	In the case of cars produced since February 1958, put the system under pressure.	
11	Bleed the brakes (see Op. ID 453-0).	

		TOOLS
	REPLACEMENT OF A PEDAL GEAR	
	Removal (see Pl.107).	
12	Disconnect the clutch cable (1) from the lever (2) on the pedal shaft; unscrew the locknut and unscrew the pedal adjusting screw (3); detach the end piece of the clutch cable from the lever (2)	12 mm box spanner
13	Disconnect the accelerator control from the pedal (4). Remove the split pin and disengage the damper and cable assembly from the accelerator pedal.	
14	Disconnect the wires from the stop light switch	8 mm box spanner
15	Remove the two upper fixing nuts (5) of the pedal gear and the master cylinder bracket. Remove the two lower fixing screws (6) of the pedal gear	12 mm box spanner
16	Remove the rubber dust cover from the side plate on the engine recess and withdraw the pedal gear.	
	Refitting (see Pl. 107).	
17	Place the pedal gear in position, insert the 2 lower fixing screws (6) (spring washers under the heads) and fit the upper fixing nuts (5) on the master cylinder bracket side (spring washers). Tighten the screws and nuts. Put the dust cover in position on the opening of the side plate on the engine recess	12 mm box spanner
18	Connect the clutch cable (1) to the lever (2).	
19	To adjust the heights of the pedals by means of the adjusting screws (3): Brake pedal: there must be a distance of "a" = $156 - {}^{0}_{0.5}$ mm from the underside of the pedal pad (rubber fitting removed) to the top of the felt mat underneath the rubber mat. Clutch pedal: there must be a distance of "b" = $148 + {}^{5}_{0}$ mm measured in the same way as for the brake pedal.	
	Lock the locknuts of the pedal adjusting screws	12 mm spanner
20	Adjust the master cylinder control rod (7) so that there is no clearance between its front end and the bottom of the bore of the piston (2) (see Pl.108). Lock the locknut (8)	16 mm spanner
21	Adjust the stop light switch control rod (9) by rotating the nuts (10). Connect the wires to the stop light switch	7 mm spanner and box spanner
22	Connect the accelerator control to the pedal (4).	

PARTICULAR POINTS

Overhauling a pedal gear.

24 *Assembly of the accelerator pedal (see Pl. 27).*

Smear the spindle screw with graphite grease.

The distance 'b' between the threaded end of the spindle screw and the inside of the pedal bracket should be 0 to 1 mm.; the distance 'c' between the pedal bearing plate and the locknut of the screw should be 0.2 to 1.7 mm.

TOOLS

OVERHAULING A MASTER CYLINDER (cars produced since February 1958).

Dismantling (see Pl.108, fig.2).

1 Remove the circlip (12) retaining the piston (13) and hold the latter to prevent the parts from scattering under the pressure of the spring (14).

2 Remove the thrust washer (15), the piston (13) complete with the cup (16), the cup (17), and the spring (14) together with its steel cup (18).

3 Disconnect the high pressure supplementary feed control (19) from the master cylinder. Remove the seal (20) from the high pressure supplementary feed control, remove the cap (21), the spring (22), the seal (23), the slide valve (24), together with the washer (25) and the circlip (26).
Remove the washer (25) and the circlip (26) from the slide valve (24) .... 12-26 mm box spanners

4 Remove the cup (16) from the piston (13).

Cleaning.

5 Clean all the parts in alcohol. Failing alcohol, perfectly clean brake fluid may be used. Do not use any other substance.

6 The master cylinder and the high pressure supplementary feed control must be free from all traces of rust and wear, otherwise they must be replaced.
Make sure that the passages "d, e, f, g, h, i, j" are not blocked.

7 Immerse all the parts in perfectly clean brake fluid.

Assembly (see Pl.108, fig.2).

8 Fit the circlip (26) and the washer (25) on the slide valve (24) and put this assembly in position in the high pressure supplementary feed control (19).

		TOOLS
9	Fit the ring seal (23) of the cap (21) and the spring (22) and tighten the high pressure supplementary feed control cap (21)	26 mm box spanner
10	Fit the ring seal (20) and connect the high pressure supplementary feed control to the master cylinder. Tighten the screws (spring washers under the heads)	12 mm box spanner
11	Fit the spring (14) together with its steel cup (18), the rubber cup (17), the piston (13) with its rubber cup (16), the washer (15) and the circlip (12).	
	OVERHAULING A MASTER CYLINDER (cars produced since February 1958).	
	Dismantling. (see Pl. 108, fig. 1).	
12	Remove the circlip (1) from the piston (2), and hold the latter to prevent the parts from scattering under the pressure of the spring (3).	
13	Remove the washer (4), the piston (2), the cup (5), the spring (3) and the valve unit (6).	
14	Remove the feed union, the unions (7) and (8) and the rubber seal (9)	19 and 21 mm box spanners
15	Remove the cup (10) from the piston (2). Remove the valve (11) from its seat.	
	Cleaning.	
16	Clean all the parts in alcohol. Failing alcohol, use perfectly clean brake fluid. Do not use any other substance.	
17	The master cylinder must not show any traces of rust or wear, otherwise a new one must be fitted. Make sure that the passages "a", "b" and "c" are not blocked.	
18	Immerse all the parts in perfectly clean brake fluid.	
	Assembly (see Pl. 108, fig. 1).	
19	Place the seal (9) in position. Fit the valve (11) on its seat and fit this assembly (6) in position. Fit the spring (3), the cup (5), and the piston (2) together with its cup (10). Fit the washer (4) and the retaining ring (1).	
20	Tighten the feed union and insert the copper washer. Fit the unions (7) and (8) and insert a copper washer on either side of the union (8)	19 and 21 mm box spanners

OVERHAULING A PEDAL GEAR

		TOOLS
	Dismantling (see Pl. 107).	
21	To remove the accelerator pedal (see Pl. 27) : Unlock the locknut (12), unscrew the screw (13) and withdraw the accelerator pedal (10)	17 mm spanner
22	Remove the adjusting nuts (10) of the stop light switch control (9). Remove the contactor fixing screws and withdraw the contactor	7 mm spanner and box spanner
23	Remove the dust cover. Remove the key securing the clutch pedal on the pedal shaft. Drive out the pedal shaft, remove the springs, the pedals and the distance piece	12 mm box spanner
24	Drive out the bushes (11), from the pedal bracket and from the brake pedal (use a shouldered mandrel)	Shouldered mandrel : Small dia. = 17.5 x 50 long. Large dia. = 21.5 x 120 long
25	Unlock the locknut (8) of the master cylinder control rod (7), unscrew the rod and remove	16 mm spanner
	Assembly (see Pl. 107).	
2	Place the bushes (11) in position in the pedal bracket and in the brake pedal (shouldered mandrel, using a press, see paragraph 24 above)	Shouldered mandrel
27	Place the parts in position in the pedal bracket in the following order: the brake pedal, the brake pedal spring, the distance piece, the clutch pedal spring, the clutch pedal and engage the shaft, previously oiled in each of the parts. Put the clutch pedal key in position. Tighten the nut (plain washer). Fit the bent end of the springs on the pedals	12 mm box spanner
28	Fit the stop light switch; engage the switch on the control rod (9), fit the adjusting nuts (10), fit and tighten the fixing screws (spring washers under the heads).	

		TOOLS
29	To refit the accelerator pedal (see Pl. 27) :	
	First grease (graphite grease) the accelerator pedal pivot screw (13), insert it in position and screw on the locknut (12). Insert the screw in the pedal bearing (14), making sure that the distance "b" = 0 to 1 mm and "c" = 0.2 to 1.7 mm are correct. Lock the locknut (12)	17 mm spanner
30	Fit the master cylinder control rod (7) complete with its locknut (8) on the brake pedal yoke (12).	
	OVERHAUL OF A REAR WHEEL CYLINDER	
	Dismantling (see Pl. 102):	
31	Remove the bleed screw, the dust-proof caps (45), the pistons (46) and the circlip (47)	10 mm box spanner
32	Remove the ring seals (49) from the pistons (46). Use a piece of brass wire flattened at one end.	
33	Clean all the parts in alcohol only.	
	Assembly (see Pl. 102):	
34	Place the circlip (47) in position.	
35	Fit the ring seals (49) on the pistons (46). Oil the pistons (46) with hydraulic fluid and fit them in the wheel cylinder, after ensuring that they are free from scratches or traces of seizure.	
36	Fit the dust caps (45) and the bleed screw	10 mm box spanner

PARTICULAR POINTS

When assembling, make sure that the pipes are aligned correctly in the centre of the unions in order to avoid damage to the pipes or the union threads

		TOOLS
	REMOVAL (see Pl. 81).	
1	Jack up the rear of the car (jacking bracket 2505-T, see Pl. 111). Remove the rear wing and the protection panels (side and lower)	Jacking bracket 2505-T 8 mm box spanner
2	Disconnect (left-hand side) the union (1) from the rear brake feed pipe (2) and from the right-hand brake connecting pipe (3) (spanner 2221-T or 2219-T, see Pl. 61, fig. 3). Disconnect (right-hand side) the left-hand brake connecting pipe (3) from the articulating pipe (4). Seal the openings in the pipes and unions (see Pl. 89)	Spanner 2219-T or 2221-T
3	Unscrew the locknut and remove the screw (5) securing the articulating pipe spindle (6). Remove the screw (7) securing the bracket on the sidemember rear closing panel. Release the rear section of the articulating pipe from the clip (8) securing it to the rear arm. Remove the articulating pipe spindle (6) from the rear arm	5-8 mm box spanners
4	Disconnect the articulating pipe (4) from the wheel cylinder (spanner 2221-T or 2219-T, see Pl. 61, fig. 3). Withdraw the pipe. Seal the opening in the wheel cylinder (see Pl. 89)	Spanner 2219-T or 2221-T
	REFITTING (see Pl. 81).	
5	Engage the articulating pipe spindle (6) in the arm. Fit the retaining screw (5) together with its locknut. Tighten the screw (5) moderately and lock the nut	5-8 mm box spanners
6	Fit the support (7) on the sidemember closing panel. Tighten the fixing screws (spring washers under the heads)......	8 mm box spanner
7	Connect the articulating pipe (4) to the wheel cylinder. Tighten the union moderately (spanner 2221-T or 2219-T, see Pl. 61, fig. 3).	
	Connect (right-hand side) the left-hand brake connecting pipe (3) to the articulating pipe (4) (spanner 2221-T or 2219-T).	Spanner 2219-T or 2221-T

TOOLS

IMPORTANT NOTE - During this operation, keep the pipe aligned in the centre of the unions in order to avoid damaging the pipe or the union threads.

9 Bleed the brakes (see Op. ID 453-0). Check the unions for leakage.

10 Fit the protector panels (lower and side). Fit the wheel and lower the car to the ground (jacking bracket 2505-T, see Pl. 111).

Tighten the wheel fixing screws to 108 to 144 ft. lbs (15 to 20 m.kg). Fit the rear wheel .... Jacking bracket 2505-T
8-14 mm box spanners

ADJUSTMENT OF THE BRAKE HANDLE LOCK (see Pl. 109).

	TOOLS
1 Make sure that the locking ratchet (14) slides freely in the lock (18); if not, adjust the position of the locking ratchet in its slots	12 mm box spanner
2 a) Unlock the locknut (12) and turn the screw (13) to regulate the length of the release rod (11) after bringing the release trigger (10) against the handbrake handle.	7 mm box spanner
b) If the brake handle does not lock in the "brake applied" position, remove the screw (13) from the release trigger (10) and check whether the rod (11) has slipped out of its guide hole "b"; if it has, proceed as described in paragraphs 7 to 14, (Op. ID 454-1).	

ADJUSTING THE CONTROL CABLE (see Pl. 110).

3 With the brake lever in the "off" position, measure the distance "a" with a steel tape measure inserted from the front passing under the gearbox crossmember support. The dimension "a" must be equal to 60 mm. Rotate the threaded sleeve (24) until this measurement is obtained and then tighten the locknut (23) to $32\frac{1}{2}$ ft. lbs (4.5 m. kg).	21 mm spanner

ADJUSTING THE CONNECTING CABLE (see Pl. 110).

4 a) With the brake lever in the "off" position, the lever (2) must be at the point of separation from the stop (27) but must still be in contact with it; if not, unlock the locknut (28) and rotate the nut (29) until the lever (2) disengages from the stop (27). Slightly slacken the nut (29) so that the lever (2) just makes contact with the stop (27).	12 mm spanner and ring spanner
b) Slacken off the brake shoes (fork 2128-T and spanner 2129-T, see Pl. 101) and operate the handbrake handle several times to take up the brake shoe clearance	Fork 2128-T Spanner 2129-T
c) Make sure that the levers (2) and (25) are in contact with their stops (27) at the point of separation therefrom and that there is no clearance at "c"; otherwise re-adjust the control cable (3) (see this operation, paragraph 3).	

PARTICULAR POINTS

Replacement of a brake handle.

10 *When assembling, secure the release trigger to the brake handle so that the release control rod does not slip out of its guide hole (on the release trigger).*

14 *To adjust the unlocking mechanism: press the release trigger, turn the adjusting screw of the release control rod until the handle is unlocked.*

15 *Adjust the control cable (see OP. ID 454-0).*

Replacement of a handbrake release trigger.

24 *Remove the handbrake handle in order to carry out this operation.*

Replacement of a locking ratchet.

33 *Secure the release trigger to the brake handle, see paragraph 10. Rotate the ratchet in order to remove it.*

REPLACEMENT OF A HANDBRAKE LEVER

Removal (see Pl.109-110).

		TOOLS
1	Remove the glove compartment and remove the central instrument board plate (do not mislay the rubber buffer of the glove compartment lid).	
2	Remove the upper panel of the instrument board. Remove the instrument panel lower metal plate and remove the lower beading.	
3	Unscrew the left hand ventilator control lever knob and remove the ventilation grille.	
4	Remove the seal from the air duct, remove the screws securing the air duct to the instrument board and withdraw the air duct towards the rear.	
5	Remove the spare wheel and the left hand front wing. Remove the left hand front side protection panel	8-12-14 mm box spanners
6	Unscrew the locknut (23) locking the threaded sleeve (24) and screw up the threaded sleeve (24) in order to slacken the cable (3) as much as possible, the threaded sleeve (24) can be rotated by hand	21 mm spanner
7	Remove the split pin (4) from the pin (5) securing the control cable (3) and drive out the pin.	
8	Remove the split pin (6) from the brake trigger pivot screw (7). Remove the nut (8), holding the screw (7) firmly, and remove the screw (7)	14-17 mm box spanners
9	Remove the hand brake trigger by pulling it downwards. Take care not to lose the hollow shaft (9).	

		TOOLS
	Refitting (see Pl.109 and 110).	
10	Secure the release trigger (10) to the brake handle so that the release control rod (11) does not slip out of its guide hole during the refitting operation. Unscrew the locknut (12) and completely unscrew the adjusting screw (13) of the release control rod (11)	7 mm box spanner
11	Engage the handle on the guide rod (14). Using a hook, pull the control cable (3) towards the rear and fit the pin (5) securing the cable to the handle. Fit the split pin (4) in the pin (5).	
12	Fit the brake handle pivot screw (7). Tighten the retaining nut (8) of the screw (7) and fit the split pin (6)	17 mm box spanner 14 mm spanner;
13	To check the operation of the handle: If the handle does not lock in the "brake on" position, remove the screw (13) from the release trigger (10) and make sure that the release control rod (11) has not slipped out of its guide hole; repeat the operation as from paragraph 7. Release the trigger (10) from the handle. After the handle has been moved into the "brake on" position, it must remain locked even if the release trigger (10) is operated.	
14	To regulate the unlocking mechanism: Press the release trigger (10) and slacken the adjusting screw (13) of the release control rod (11) until the handle is unlocked. Make sure that the handle is operating satisfactorily and lock the locknut (12)	7 mm box spanner
15	To adjust the control cable. With the handle of the brake in the "brake off" position measure the distance "a", use a steel tape measure inserted from the front under the gearbox crossmember support. This dimension "a" must be equal to 60 mm. Obtain this measurement by rotating the threaded sleeve (24). Tighten the locknut (23) to $32\frac{1}{2}$ ft.lbs (4.5 m.kg)	21 mm spanner
16	Fit the air duct and tighten the fixing screw on the instrument board (plain and spring washers under the head). Fit the seal.	
17	Fit the ventilator grill. Tighten the upper fixing screw (plain washer under the head) and tighten the lower fixing screw (cup washer under the head). Screw on the ventilator control lever knob	8 mm box spanner
18	Fit the lower instrument panel lower flange and tighten the fixing screws (cup washers under the heads).	
19	Fit the lower metal plate of the instrument board and tighten the fixing screws (cup washers under the heads).	

		[illegible]
20	Fit the upper panel of the instrument board and tighten the fixing screw (cup washer under the head).	
21	Fit the glove compartment and tighten the fixing screws.	
22	Fit the central panel of the instrument board and tighten the fixing screws (rubber buffer of the glove compartment under the upper fixing screw).	
23	Fit the left-hand side protection panel. Fit the left-hand front wing. Fit the spare wheel	8-12-14 mm box spanners

REPLACEMENT OF A HANDBRAKE RELEASE TRIGGER

Removal (see Pl. 109).

24	Remove the handbrake handle (see this operation, paragraphs 1 and following).	
25	Unscrew the locknut (12) and remove the adjusting screw (13) of the release control rod (11)	7 mm box spanner
26	Using a 4.5 mm drill break the rivetted joint (at "a") of the fulcrum pin (15) of the release trigger (10). Remove the fulcrum pin (15).	
27	Disconnect the spring (16) from the rod (11). Withdraw the rod from the guide hole on the trigger and remove the trigger.	

Refitting (see Pl. 109).

28	Hold the release control rod (11) from the front and place the release trigger (10) in position on the brake handle.	
29	Fit the trigger fulcrum pin (15) (make sure that it is correctly positioned). Rivet the fulcrum pin on the brake handle with a 90° punch.	
30	Insert the release control rod (11) in the guide hole in the trigger. Connect the spring (16) to the rod (11).	
31	Fit the release control rod adjusting screw (13) together with its locknut (12) on the trigger (10).	
32	Fit the handbrake handle (see paragraphs 10 and following, this operation).	

REPLACEMENT OF A LOCKING RATCHET

		TOOLS
	Removal (see Pl. 109).	
33	Hold the release trigger (10) against the brake handle.	
34	Remove the split pin from the fulcrum pin (17) of the locking ratchet (14). Remove the fulcrum pin and the springs acting as spacers between the ratchet and its support.	
35	Pull the brake handle home in the "brake on" position. Rotate the ratchet half a turn and remove it from the bottom.	
	Refitting (see Pl. 109).	
36	With the brake handle in the "brake on" position, engage the ratchet (14) in the handbrake lever (head of the locking guide towards the top) and then turn over.	
37	Insert the fulcrum pin (17) in the locking ratchet (14) support and put one spacer spring, the ratchet and the second spacer spring in position. Insert a split pin in the fulcrum pin.	
38	Free the release trigger. Check the brake control for correct operation and adjust if necessary (see Op. ID 454-0).	

REPLACEMENT OF A CONTROL CABLE

		TOOLS
	Removal (see Pl. 109 - 110).	
39	Remove the spare wheel, the left-hand front wing, the battery, the battery tray and the left-hand protection panel.	8-12-14 mm spanners and box spanners
40	Get an assistant to set the right-hand brake control lever (2) in the "brake on" position. Remove the sheath socket from the lever (25) and remove the cable socket from the control lever (26).	
41	Remove the control cable and sheath assembly from the guide bush on the sidemember.	
42	Remove the split pin (4) from the pin (5) securing the control cable (3) to the handbrake control lever. Remove the pin and the cable.	
43	Unlock the locknut (23) on the threaded sleeve (24) and unscrew the sleeve completely. Remove the cable, sheath, spring and threaded sleeve assembly	21 mm spanner
44	Unscrew the locknut (23) on the threaded sleeve (24) and remove the sleeve from the cable (3).	

		TOOLS
	Refitting (see Pl. 109 - 110).	
45	Fit the threaded adjusting sleeve (24) on the cable (3) and fit the locknut (23).	
46	Place the cable, sheath, spring and adjusting sleeve in position on the car. Screw up the threaded sleeve (24) a few threads.	
47	Connect the cable (3) to the handbrake control lever; fit the securing pin (5) and insert the split pin.	
48	Insert the cable and sheath assembly in the guide bush on the sidemember. Get an assistant to hold the right-hand brake unit control lever (2) in the "brake on" position; connect the cable (3) to the control lever (26) and connect the sheath to the left-hand brake unit lever (25).	
49	Adjust the control cable and the connecting cable (see Op. ID 454-0).	
50	Fit the left-hand side protection panel, the battery tray, the battery, the left-hand front wing and the spare wheel ...	8-12-14 mm spanners and box spanners
	REPLACEMENT OF A CONNECTING CABLE	
	Removal (see Pl. 110).	
51	Drain the radiator and retain the liquid which contains anti-freeze solution. Remove the radiator and the front engine crossmember support (see Op. ID 133-1).	
52	Remove the nuts (28) and (29) for adjustment of the connecting cable (1). Remove the socket of the cable (1) from the right-hand brake control lever (2). Remove the sheath sockets from the brake yokes and then from the cable (1). Remove the cable and sheath assembly from the right-hand side of the car	12 mm spanner and box spanner
	Refitting (see Pl. 110).	
53	Fit the cable and sheath assembly from the right-hand side of the car. Insert it in succession through the bore in the right-hand brake yoke, through the hole in the gearbox support bracket, left-hand side, and then through the bore in the left-hand brake yoke.	
54	Pull the centre portion of the cable (1) towards the rear and put the sheath sockets in position. Connect the cable to the right-hand lever (2) and to the left-hand lever (26). Fit the nuts (28) and (29)	12 mm spanner and box spanner
55	Fit the front engine crossmember support and the radiator (see Op. ID 133-1).	
56	Adjust the connecting cable (1), check the adjustment of the control cable (3) and make any necessary adjustments (see Op. ID 454-0).	
57	Fill the radiator with the engine running.	

TOOLS

REMOVAL (see Pl. 109).

1 Remove the hollow fulcrum pin (9) from the lever.

2 To remove the release trigger (10) :

a) With a 4.5 mm drill, remove the rivet joint of the pin (15) at "a" (see fig. 4). Remove the pin.

b) Unlock the locknut (12) and remove the screw (13) and the locknut.

c) Tilt the lock (18) upwards and remove the release trigger .... 7 mm box spanner

3 To remove the lock (18) :

a) Remove the split pin from the lock fulcrum pin (19). Remove the washer (20) and the pin (19). Do not lose the distance washer (21).

b) Remove the release rod and lock assembly. Remove the rod (11) from the lock (18).

4 Remove the return spring (16) from the lock (18).

ASSEMBLY (see Pl. 109).

5 Put the spring (16) in position in the control lever.

6 Fit the release trigger (10) and fit the pin (15) without rivetting it.

7 To fit the lock (18) :

a) Engage the release rod (11) in the lock (18) and position this assembly in the control lever, with the end of the rod engaged in the bore "b" in the release trigger (10).

b) Fit the pin (19), the distance washer (21) and the washer (20) and lock the pin (19) with a split pin.

c) Attach the spring (16) to the release rod (11).

8 Hold the release trigger (10) locked against the lever control handle and rivet the release trigger fulcrum pin (15) (at "a", see fig. 4).

9 Fit the hollow pin (9) in the lever bearing (22) after previously oiling.

SCHEDULE OF PARTS

1	Headlamp, right-hand.	24	Interior light switch.
2	Headlamp, left-hand.	25	Ignition switch.
3	Horn, low note.	27	Combined lighting and horn switch.
4	Horn, high note.	28	Rear parking light, right-hand side.
5	Flashing direction indicator lamp, front right-hand.	29	Rear parking light, left-hand side.
6	Flashing direction indicator lamp, front left-hand.	30	Interior lamp.
9	Dynamo.	31	Petrol gauge tank unit.
12	Regulator.	33	Flashing direction indicator lamp, rear right-hand.
13	Battery.	34	Flashing direction indicator lamp, rear left-hand.
14	Distributor.	36	Rear lamps (red light, stop light and number plate light).
15	Windscreen wiper motor.	41	Starter solenoid switch.
16	Stop lamp switch.	44	Switch for windscreen wiper motor.
17	Coil.	47	Terminal for accessories.
19	Flashing lamp switch.	49	Warning light.
20	Rheostat for instrument panel lights.	50	Clock.
22	Gauge dial.		
23	Instrument panel lights.		

WIRE No.	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
1	Front.	Front light terminal on lighting and horn switch (27) . . . . to male connector (1).	Red
2		Terminal of combined lighting and horn switch (27) . . . . to male connector (2).	Green
3		Headlamp terminal on lighting and horn switch (27) . . . . to male connector (3).	Yellow
4		Rear light terminal on lighting and horn switch (27) . . . . to rheostat for instrument panel lights (20). to rear male connector (4).	Mauve
5		High note horn terminal on lighting and horn switch (27) . . . . to male connector (5).	White.

WIRE No.	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
6	Front	Low note horn terminal on lighting and horn switch (27)	Blue
		to male connector (6).	
7		Feed terminal on lighting and horn switch (27)	Black
		to BAT terminal of regulator (12).	
		to the positive terminal of the flashing lamp time switch (19).	
		to the ignition switch (25).	
		to the interior light switch (24).	
		to the parking light switch (26).	
		to the male connector (7) of the starter solenoid switch (41)	Green
		to the terminal for accessories (47)	Green
8		Violet terminal of the ignition and starter switch (25)................................	Violet
		to the switch for windscreen wiper motor (44).	
		to the male connector (8) of the warning light (49).	
		to the stop lamp switch (16).	
		to the gauge dials (22).	
		to the coil (17)	Black
10		Rheostat for instrument panel lights (20)	Red
		to the instrument panel lights	
12		Terminal of the ignition switch (25)	Red
		to earth	Green
13		Terminal of the flashing light time switch (19)	Green
		to earth.	
14		Ignition switch (25)	Red
		to the terminal (14) of the solenoid switch (41).	
15		Yellow terminal of the windscreen wiper motor switch (44)	Yellow
		to the windscreen wiper motor (15).	
16		Terminal G of the flashing light time switch (19)	Violet
		to the male connector (16).	
18		Terminal D of the flashing light time switch (19)	Violet
		to the male connector (8).	
20		Warning light (49)	Red
		to the dynamo terminal of the regulator (12).	
21	Separate wires	Male connector (8)	Violet
		to the warning light (49).	

WIRE No.	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
22	Separate wires	Stop lamp switch (16) ... to the rear male connector (22).	Violet
23		Clock (50) ... to the terminal for accessories (47).	Green
24	Dynamo to regulator	Regulator earth ... to dynamo.	Black
25		Dynamo ... to field terminal on the regulator (12).	Yellow
26		Dynamo ... to dynamo terminal on the regulator (12).	Red
27	Headlamps.	Male connector (18) of the front harness ... to the flashing direction indicator lamp, front right-hand (5).	Violet
28		Male connector (3) of the front harness ... to the headlamp terminal of the front right-hand headlamp (1).	Yellow
29		Male connector (2) of the front harness ... to the terminal of the front right-hand headlamp (1).	Green
30		Male connector (1) of the front harness ... to the front light terminal of the front right-hand headlamp (1).	Red
31		Male connector (5) of the front harness ... to the high note horn (4).	White
32		Male connector (6) of the front harness ... to the low note horn (3).	Blue
33		Male connector (1) of the front harness ... to the front light terminal of the front left-hand headlamp (2).	Red
34		Male connector (2) of the front harness ... to the terminal of the front left-hand headlamp (2).	Green
35		Male connector (3) of the front harness ... to the headlamp terminal of the front left-hand headlamp (2).	Yellow
36		Male connector (16) ... to the flashing direction indicator, front left-hand (6).	Violet
37		Flashing direction indicator earth, front right-hand (5). to the earth of the front right-hand headlamp (1). to the earth of the car.	

WIRE No.	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
38	Headlamps ...	Flashing direction indicator earth, front left-hand (6). to the earth of the front left-hand headlamp (2). to the earth of the car.	
40	Rear	Yellow male connector of the gauge dial (22) .... to petrol gauge tank unit (31).	Yellow
41		Interior light switch (24) .... interior lamp (30).	Black
42		Terminal G of the flashing lamp switch (19) .... to flashing direction indicator lamp, rear left-hand side (34)	Violet White
43		Terminal G of flashing lamp switch (19) .... to flashing direction indicator lamp, rear right-hand side (33)........	Brown Blue
44		Male connector (22) .... to rear stop lights (36).	Violet
45		Male connector (4) .... to rear lights (36).	Mauve
46		Switch for parking light (26) .... to rear right-hand parking light (28).	Red
47		Switch for parking light (26) .... to rear left-hand parking light (29).	Green
50	Primary wire	Coil (17) .... to distributor (14).	Red

	ID 19 'Luxe' and 'Confort' ID 19 'Normale'	ID 19 U.S.A. and business type	ID 19 type for cold countries	ID 19 'Break' and derivatives
Instrument panel light	2-706.616	2-706.639	2-706.722	2-706.722
Headlight	2-706.670	12 V-36/45 W White bulb	12 V-36/45 W White bulb	2-706.671
Side light (front)	2-707.193	2-707.194	2-707.194	2-707.194
Parking lights	2-706.616	None	2-706.639	2-706.639
Rear light	2-706.620	2-706.604	2-706.604	2-706.604
Stop light	2-706.570	2-706.604	2-706.604	2-706.604
Number plate light	2-706.620	2-706.704	2-707.194	2-707.194
Front flashing direction indicator	2-706.570	2-706.702	2-706.604	2-706.604
Rear flashing direction indicator	2-706.570	2-706.703	2-706.604	2-706.604
Central interior light	1-5.220	None	None	None
Front interior light	None	None	None	2-706.717
Rear interior light	None	2-706.067	2-706.067	2-706.067
Boot light	None	1-707.194	1-707.194	None
Blue warning light (headlights)	None	1-706.715	1-706.715	1-706.715
Green warning light (indicator)	None	1-706.715	None	None
Red warning light (oil pressure)	None	None	None	1-706.704

		TOOLS
	REMOVAL	
1	Remove the battery. Remove the clamping rods and protecting plate	8 mm box spanner
2	Remove the battery tray with its drain pipe.	
3	Disconnect the dynamo tie-rod and remove it	12 mm box spanner
4	Unscrew the two screws fixing the dynamo	14 mm spanner and ring spanner
5	Swing the dynamo towards the engine and disengage the belt.	
6	Unscrew the front fixing screws, remove the rear fixing screw and remove the dynamo	14 mm spanner and ring spanner
	REFITTING	
7	Put the dynamo in position, the front fixing plate between the plain washer and the bellhousing.	
8	Fit the rear fixing screw (spring washer under the head). Screw up the front and rear fixing screws.	
9	Swing the dynamo towards the engine, put the belt in position on the pulley.	
10	Fit the dynamo tie-rod, tighten the belt moderately. Tighten the nut fixing the tie-rod on the dynamo (plain and spring washers) and tighten the dynamo fixing screws	12-14 mm spanners 14 mm ring spanner
11	Fit the battery tray, fit and connect the battery. Put the tie-rods and frame fixing the battery in position.	12 mm box spanner

		TOOLS
	OVERHAULING A DUCELLIER 7158-A DYNAMO	
	Dismantling (see Pl. 114 and 115).	
1	Remove the driving pulley (1), remove the Woodruff key (2)	21 mm box spanner
2	Remove the screws (3) fixing the end bearing plates	10 mm box spanner
3	Remove the end bearing plate (4) driving side, and the steel cap (5).	
4	Remove the armature (6), remove the fibre washer (7), commutator side.	
5	Disconnect the output terminal (8) from the positive brush holder (9). Disengage the rear end bearing plate (10). Remove the brushes (11) and (12).	
6	Remove the closing plate (13) for the housing of the bearing (14) from the end bearing plate (4) by grinding the heads of the rivets. Take out the bearing (14) and the inner dust cover (15) and outer (16).	
7	Drive out the bush (17) from the end bearing plate brush holder (10) and the closing plate (18) by means of a shouldered mandrel	Shouldered mandrel : Small dia. = 16.8 Length = 15 Large dia. = 20 Length = 150
8	To remove the field coils : a) Unrivet the feed leads (19) and (20) from the field coils (21). b) Remove the closing plate (22) with the cable harness (23). c) Mark and remove the pole pieces (24) (using the screwdriver MR-1601-4 mounted on a bench press, see Pl. 122).	Screwdriver MR-1601-4
9	Clean the parts.	
	Assembly (see Pl. 114 and 115).	
10	Check the armature shaft on vee blocks or between centres.	
11	Check the armature on a suitable insulation tester.	
12	Grind the commutator. Do not reduce the original diameter of 47 mm by more than 2 mm.	

TOOLS

13 Remove the insulation from the commutator after grinding by means of a saw blade thinned down to the width of the insulation or with a file.

14 Check the field coils by means of a test lamp.

15 With a 110 volt or preferably a 220 volt test lamp, check the insulation of the positive brush holder (9) in relation to earth.

16 If necessary unrivet the positive brush holder (9).

17 To re-assemble the end bearing plate brush holder :

a) Put the bush (17) in the end bearing plate (use a shouldered mandrel) and the closing plate (18) putting the felt washer in between. Knock the metal back lightly so as to retain the closing plate (18) ....

Shouldered mandrel:
Small dia. = 16.8
Length = 15
Large dia. = 20
Length = 150

b) Rivet the positive brush holder (9). Insert the rivets in the end bearing plate (10) and then insert the insulating plate (25), the brush holder (9) :
Spring side, insert the insulating bush (26), the insulating washer (27), the steel washer (18), rivet up the rivet (29).
Opposite side, insert the bush insulating the connecting plate (30), the insulating washer (31), the steel washer (32), rivet up the rivet (33).

c) Fit the brushes in the brush holders. Connect the cables and tighten the screws fitting the spring washers under the heads. Hold the brushes in the raised position by means of the springs as shown on Pl. 115.

18 To assemble the field coils :

To ensure the correct positioning of the pole pieces and coils in the body of the dynamo and to obtain a clearance of 0.45 mm maximum, it is necessary to use a mandrel of 68.5 mm diameter.

a) Put the field coils (21) in position in the body of the dynamo.
Fit the pole pieces (24) according to the markings, provisionally tighten the screws.

b) Insert the mandrel between the pole pieces, in a press (use the mandrel MR-1601-2 with the support block MR-1601-3, see Pl. 122). Lock the screws fixing the pole pieces (use the screwdriver MR-1601-4 fitted on a bench press, see Pl. 122). Take out the mandrel from the opposite side to that from which it was put in ....

Mandrel MR-1601-2
Support block MR-1601-3
Screwdriver MR-1601-4

c) To put the cable harness (23) in position in the closing plate (22).
Insert a round head screw of 4 diameter x 15 long, fitted with a plain washer under the head, in the plate (34) and the body of the dynamo. Fix the earth terminals (20) and (37) by this screw. Tighten the nut fitting a serrated washer ....

7 mm spanner

		OOLS
	d) To fix the field terminals (19) and (41). Use a round head screw 4 dia x 20 mm long. fitting a plain washer under the head, an insulating washer (38), the insulating bush (36); insert the screw thus prepared in the closing plate (34) then in the body of the dynamo. Fit on the screw, the insulating plate (35), the output terminal (19) of the field coils (21), the terminal of the field cable, a serrated washer. Tighten the nut	7 mm spanner
	e) Tin solder with a soldering iron the joint between the two field coils.	
	NOTE - Never use killed hydrochloric acid, but special soldering paste or resin.	
19	To assemble the end bearing plate, driving side:	
	a) Grease the bearing (14) with high melting point grease.	
	b) Fit in the bearing end cap, the dust excluding washer (16), the bearing (14), the dust excluding washer (15).	
	c) Fix the retaining plate (13) on the end bearing plate (14). Replace the original rivets by round head screws 4 dia. x 15 long with serrated washers and nuts	7 mm box spanner
20	Fit on the armature the thrust washer (7) and the steel cap (5). Insert the armature (6) in the end bearing plate brush holder (10). Bring the brushes into contact with the commutator. Make sure that the springs (39) of the brushes are correctly positioned.	
21	Insert the assembly of the armature and end bearing plate in the body of the dynamo. Insert the end bearing plate (4) driving side, on the armature shaft (6). Fix the two end bearing plates by means of the screws (3) fitted with their insulators, fit serrated washers under the nuts	10 mm box spanner
22	Connect the output lead (8) to the positive brush holder.	
23	Place the key (2) on the shaft. Fit the driving pulley (1); fitting a serrated washer under the nut (40)	21 mm box spanner
24	To test the dynamo on a bench:	
	Dynamo without regulator, field on the positive terminal:	
	No load and cold: 6.5 volts at 950 r.p.m. maximum. Under load and cold: 6.5 volts at 2850 r.p.m. 32 amps. Under load and warm: 6.5 volts at 3000 r.p.m. 30 amps maximum.	

OVERHAULING A PARIS-RHONE G.11-R.91 DYNAMO

		TOOLS
	Dismantling (see Pl.116 and 117).	
25	Remove the driving pulley (1) and remove the key (2).	
26	Knock back the tabs of the lockwasher (3) remove the nut and the screw (4) fixing the end bearing plates (5) and (6).	
27	Remove the end bearing plate (5) driving side with the armature (7).	
28	Remove the end bearing plate brush holder (6), disconnect the terminal (8) from the positive brush holder	7 mm box spanner
29	Remove the end bearing plate (5) from the armature (7) in a press, if necessary.	
30	Remove the closing plate (10) by grinding the rivets. Take out the bearing (11), from the end bearing plate (5).	
31	Unsolder the connection (12) of the field coils (13).	
32	Unsolder the terminal (14) from the end of the yellow field cable. Withdraw the cable from the sheath.	
33	Remove the earth terminal (15) from the field coils by driving out the rivets (16).	
34	To remove the field coils: a) Mark and remove the pole pieces (17) (use the special screwdriver MR-1601-4, fitted on a bench press, see Pl. 122). b) Remove the pole pieces (17) and the field coils (13).	Screwdriver MR-1601-4
35	Drive out the bush (18) from the end bearing plate brush holder (6) and the closing plate (19) using a shouldered mandrel	Shouldered mandrel Small dia. = 16.8 Length = 15 Large dia. = 20 Length = 150
36	Remove the positive brush (20) and the negative brush (21).	
37	Clean the parts.	
	Assembly (see Pl.116 and 117).	
38	Check the armature shaft on Vee blocks or between centres.	
39	Check the insulation of the armature with a suitable insulation tester.	

		TOOLS
40	Grind the commutator. Do not reduce the original diameter of 41.5 mm by more than 2 mm.	
41	Remove the commutator insulation after grinding by means of a saw blade thinned down to the width of the insulation or with a file.	
42	Check the field coils with a test lamp.	
43	With a 110 volt or 220 volt test lamp check the insulation of the positive brush holder (22) in relation to earth.	
44	Unrivet the positive brush holder (22).	
45	To reassemble the end bearing plate brush holder.	
	a) Put the bush (18) in position in the end bearing plate (using a shouldered mandrel) and the closing disc (19). Knock back the metal of the end bearing plate to retain it	Shouldered mandrel Small dia. = 16.8 Length = 15 Large dia. = 20 Length = 150
	b) To rivet the positive brush holder (22). 1. Spring side: Place on the round head rivet the insulating washer and the insulating bush. Insert the rivet thus prepared into the end bearing plate; then fit the insulating plate (24), the steel packing (25) and the brush holder (22). Rivet. 2. Connection side: Engage the flat head rivet in the square of the connection (26) and in the brush holder (22), the steel packing (25), the insulating plate. Turn over the end bearing plate. Insert the insulating bush (27), the insulating washer (28), the plain washer (29). Rivet the rivet (30).	
	c) Fit the brushes (20) and (21) in the brush holder. Connect the cables and tighten the screws, fitting serrated washers under the heads. Hold the brushes in the raised position by means of the springs as shown on Pl.117.	
46	To fit the field coils: To ensure correct positioning of the pole pieces and coils in the body of the dynamo and to obtain a clearance of 0.45 mm maximum, it is necessary to use a mandrel of 72.6 mm dia.	
	a) Put the field coils (13) in the body of the dynamo. Fit the pole pieces (17) according to the markings, tighten the screws provisionally.	
	b) Insert the mandrel between the pole pieces, in a press (using the mandrel MR-1601-2, with support block MR-1601-3, see Pl.122). Tighten the fixing screws (using the screwdriver MR-1601-4, fitted under a bench press, see Pl.122). Take out the mandrel from the opposite side to that from which it was put in	Mandrel MR-1601-2 Support block MR-1601-3 Screwdriver MR-1601-4
47	Fix the earth terminal (15) for the field coils (13) with the terminal of the earth lead (31) of the regulator. Replace the original rivet by a round head screw with a nut and spring washer	7 mm box spanner

		TOOLS
48	Insert the yellow field cable in the sheath.	
49	Solder the terminal (14) on the end of the yellow cable and solder the connection on the field coils, then carefully insulate the soldering.	
	NOTE - Never use killed hydrochloric acid, but special soldering paste or resin.	
50	To assemble the end bearing plate (5) driving side:	
	a) Grease the bearing (11) with high melting point grease.	
	b) Place the bearing (11) in the end plate and fix the plate (10) with rivets.	
51	Insert the armature (7) in the end bearing brush holder (6).	
	Bring the brushes into contact with the commutator. Make sure that the brush springs (32) are correctly positioned ..	7 mm box spanner
52	Insert the assembly of the armature and end bearing plate in the body of the dynamo. Correct the output cable.	
	Engage the end bearing plate, driving side on the armature (7). Fix the two plates (5) and (6) by means of the screws (4), tighten the nuts (33) (serrated washers)	10 mm box spanner
53	Fit the key (2). Fit the driving pulley, tighten the nut (34) (spring washer)	21 mm box spanner
54	Test the dynamo on a bench:	
	Dynamo without regulator, field on the positive terminal:	
	No load and cold: 6.5 volts at 950 r.p.m. maximum. Under load and cold: 6.5 volts at 2850 r.p.m.: 32 amps on resistance. Under load and warm: 6.5 volts at 3000 r.p.m.: 30 amps maximum.	

REMOVAL

		TOOLS
1	Release the pressure.	
2	Remove the sphere from the right-hand suspension cylinder. Seal the cylinder (cap D 434-70, see Pl. 89).	
3	Seal the sphere (cap D 433-82, see Pl. 89).	
4	Remove the exhaust manifold shield. It may be necessary to bend this shield in order to move it towards the front	12 mm box spanner
5	Disconnect the starter feed cable	14 mm box spanner
6	To remove the starter motor: unlock the locknut and unscrew the pointed screw a few turns from the housing. Unscrew a few turns the pointed reaction screws situated under the clutch bellhousing. Move the starter motor from its housing and disengage from the rear. If necessary turn the body of the starter to simplify this operation.	14-17 mm tee spanners

REFITTING

		TOOLS
7	Engage the Bendix housing of the starter motor in its housing in the crankcase. If necessary turn the body of the starter motor to simplify this operation: a slight push should be sufficient to pass the starter motor between the manifold and the body.	
8	Tighten the pointed screw and its locknut. Do not tighten excessively as this will only distort the Bendix housing	14-17 mm tee spanners
9	Tighten the pointed reaction screws. Lock the locknut	12 mm spanner
10	Connect the starter motor cable: insert a serrated washer under the terminal and tighten the nut	12-14 mm box spanners
11	Refit the exhaust manifold shield. It may be necessary to slightly bend this shield in order to put it in position.	12 mm box spanner
12	Fit the fixing screws, insert a plain and spring washer under the heads.	
13	Fit the sphere (replace the seal plate after each removal).	
14	Start the engine, put the systems under pressure, check for leakage between the sphere and the suspension cylinder.	

OVERHAULING A DUCELLIER 6003-A STARTER MOTOR

Dismantling (see Pl. 118 and 119).

		TOOLS
1	Remove the circlip (1) disengage the distance washers (2).	
2	Remove the nuts (3) fixing the front and rear end bearing plates	10 mm box spanner
3	Disengage the Bendix housing (4). Disengage the armature (5) with the intermediate bearing (6). Disengage the rear thrust washer (7). Disengage the end bearing plate brush holder (8) from the body of the starter, remove the positive brush (9) from its brush holder, completely remove the rear bearing plate (8).	
4	Remove the Bendix assembly (10) from the armature shaft (5). Disengage the Woodruff key (11). Disengage the intermediate bearing plate (6)	16 mm spanner
5	To dismantle the end bearing plate brush holder :	
	a) Grind the heads of the rivets of the positive brush holder (12), drive out the rivets. Remove the insulating washers and insulating bushes.	
	b) Grind the heads of the rivets of the negative brush holder (13), drive out the rivets. Disengage the negative brush.	
6	Drive out the bearings (14) from the rear bearing plate (8) and the centre bearing plate (6) and from the Bendix housing (4) using a shouldered mandrel	Shouldered mandrel : Small dia. = 15.5 Length = 15 Large dia. = 18.5 Length = 150
	NOTE - If the field coils are to be removed, it is preferable to remove the positive brush after this operation. With a soldering iron, heat the brush wire on its connection and disengage by pulling the wire with pliers.	
7	To remove the field coils :	
	a) Unscrew the nut (15), remove the serrated washer (16), the steel washer (17), the shouldered insulating bush (18).	14 mm box spanner
	b) Remove the four screws fixing the pole pieces (use the special screwdriver MR-1601-4, fitted on a bench press, see Pl. 122)	Screwdriver MR-1601-4
	c) Mark and remove the pole pieces (19).	
	d) Remove the field coils (20) with the terminal (21). Remove the insulating washer (22).	
	e) Unsolder the terminal (21).	

TOOLS

8 To replace the springs of the 'BANDA' pinion assembly (see Pl.121 A):

a) Release the spring to be replaced, from the sleeve and from the pinion, by cutting it on a grinding wheel if necessary.

b) Prepare the tooling indicated in figs. 6, 7 and 8.

c) Prepare the new springs: using lever MR-3526-12 as shown in fig. 1 and 3, deflect the end coils so as to bring the tips of the springs to approximately 'a' = 24 mm from one another (see fig.2).

d) Fit the springs (see fig.4 and 5):

1. Fit the threaded sleeve (1) on the threaded shaft, gripped in a vice.
2. Fit the springs. If necessary, lever apart the tips of the springs by means of two screwdrivers, so as to insert them in the holes in the sleeve (1).
3. Fit the pinion and its sleeve (2). If necessary, separate the tips of the springs by means of two screwdrivers, so as to insert them in the holes in the sleeve (2) of the pinion.
4. Remove the pinion assembly from the threaded shaft.

e) Place the tips of the springs in position (see fig.4):

1. Fit the spring on the support MR-3526-13 (see fig.5) and close up the spring coils, by means of a press. Insert a piece of sheet-metal between the end of the press and the support.
2. Repeat the operation several times, so as to restore the springs original form. Ensure that the tips of the springs are properly located inside the holes in the sleeve (1) and the sleeve (2) of the pinion. ....

Support MR-3526-11
Lever MR-3526-12
Support MR-3526-13

9 Clean the parts.

Assembly (see Pl.118 and 119).

10 Check the armature on Vee blocks or between centres.

11 Check the insulation of the armature with a suitable insulation tester.

12 Grind the commutator. Do not reduce the original diameter of 40 mm by more than 2 mm. Remove the commutator insulation after grinding, by means of a saw blade thinned down to the width of the insulation, or with a file.

13 Check the field coils with a test lamp.

14 If the bearing plate brush holder (8) is not stripped, check, with a 110 volt or preferably a 220 volt test lamp, the insulation of the positive brush holder (12) in relation to earth.

15 To connect the positive brush (9). Solder the brush wire on its coil connection, using a soldering iron.

NOTE - Never use killed hydrochloric acid, but special soldering paste or resin.

		TOOLS
16	To assemble the field coils :	
	a) Put the insulating washer (22) on the terminal (21). Fit the terminal (21) on the starter motor. Then fix provisionally, positioning the slot of the terminal to allow the fitting of the connection.	
	NOTE - To ensure the correct positioning of the pole pieces and coils in the body of the starter and to obtain a clearance of 0.5 mm maximum it is necessary to use a mandrel of 74.4 mm diameter.	
	b) Fit the field coils (20), fit the pole pieces (19) provisionally tighten the screws.	
	c) Insert the mandrel between the pole pieces, in a press (use the mandrel MR-1601-1 and support block MR-1601-3 see Pl. 122). Lock the screws fixing the pole pieces (use the screwdriver MR-1601-4, fitted on a bench press, see Pl. 122). Take out the mandrel from the opposite side to that from which it was put in	Mandrel MR-1601-1 Support block MR-1601-3 Screwdriver MR-1601-4
	d) Put the end of the connection in the slot of the terminal (21). With a soldering iron, tin solder the connection and the terminal.	
	e) Fit on the terminal (21) the shouldered insulating bush (18), the steel washer (17), the serrated washer (16). Tighten the nut (15)	14 mm box spanner
17	To prepare the end bearing plate brush holder:	
	NOTE - The bearings in the bearing plate are made of porous bronze. Before assembly, soak the bearings for approximately 24 hours in a bath of engine oil, so that the bronze becomes impregnated, no further oiling should be necessary.	
	a) Put the bearings (14) in position, using a shouldered mandrel, stop driving in when the bearing is level with the outer face of the bearing plate	Shouldered mandrel : Small dia. = 15.5 Length = 15 Large dia. = 18.5 Length = 150
	b) To fit the negative brush holder (13) insert the terminals in the 2 holes of the brush (23). Fit the brush holder (13), peen over the rivets (22).	
	c) To fit the positive brush holder (12), insert the insulating plate (25) between the bearing plate and the brush holder. Put in position the insulating bushes (26), the insulating washer (27), the rivets (28). Peen over the rivets.	
18	Fit the bearings (14) in position in the intermediate bearing plate (6) and the Bendix housing (4). Use a shouldered mandrel	Shouldered mandrel : Small dia. = 15.5 Length = 15 Large dia. = 18.5 Length = 150

		TOOLS
19	Fit on the armature shaft the intermediate bearing cap (6). Put the Woodruff key (11) in position. Fit the Bendix assembly (10), tighten the grub screw (29), put the circlip (30) in the slot of the screw	16 mm spanner
20	Engage the armature (5) in the body of the starter motor, the intermediate bearing plate is positioned by a dowel pin.	
21	Engage the Bendix housing (4) on the armature shaft (5) and assemble to the body of the starter motor, tighten the fixing studs fitted with their insulation.	
22	To fit the end bearing plate brush holder : a) Put the thrust washer (7) on the armature shaft, commutator side. b) Engage the positive brush (9) in its holder (12). In order to allow the armature to enter, hold the brushes by their springs, in a raised position as shown on Pl. 119, fig. 3. c) Offer up the bearing plate brush holder (8). Before completely putting the bearing plate in position, release the brushes so that they come in contact with the commutator. Make sure that the brushes are correctly positioned. d) Tighten the nuts (3) and insert spring washers under the nuts	10 mm box spanner
23	To adjust the end play of the armature: Fit the distance washers (2); fit the circlip (1). Using a feeler gauge, make sure that the end play is between 0.2 and 1.3 mm. If necessary alter the thickness of the distance washers (2).	
24	Test the starter motor on a bench : The current comsumed is :- When starting up : 180 to 200 amps. Rotating with no load : 50 to 80 amps.	
25	Paint the unit.	

OVERHAULING A PARIS-RHONE D-11 B 42 STARTER MOTOR

	Dismantling (see Pl. 120 and 121).	
26	Remove the screw (1) fixing the front and rear end bearing plates	14 mm box spanner
27	Remove the Bendix housing (2).	
28	Remove the armature (3) from the body of the starter motor with the centre bearing plate (4).	
29	Disconnect the brush holder assembly (5) from the rear bearing plate (6). To do this, remove the screw (7)	8 mm box spanner

TOOLS

30 Disengage the positive brushes (8) from their holder, disengage the brush holders (5).

31 Remove the Bendix assembly (9) from the armature (3). Disengage the Woodruff key (10), the adjusting washers (11), the centre bearing plate (4), the adjusting washers (12).

32 Drive out the bearings (13) from the rear end bearing plate (6), from the centre bearing plate (4) and from the Bendix housing (2) (use a shouldered mandrel) ....

Shouldered mandrel :
Small dia. = 15.5
Length = 15
Large dia. = 18
Length = 150

NOTE - If the field coils are to be changed, it is preferable to remove the brushes after this operation. With a soldering iron heat the brush wire on its connection and disengage by pulling the wire with pliers.

33 To remove the field coils :

a) Remove the nut (14), the steel washer (15) and the two fibre washers (16).

b) Remove the screw (17) fixing the pole pieces (18) (use the screwdriver MR-1601-4, fitted on a bench press, see Pl. 122) ....

Screwdriver MR-1601-4

c) Mark and remove the pole pieces (18).

d) Disengage the field coils (19) with the terminal (20).
Disengage the insulating washers (21).

e) Unsolder the terminal (20) and disengage.

f) Disengage the insulating bush (22) from the starter body.

34 To strip the pinion assembly:

Press back the sleeve (23) in order to gain access to the circlip (24). Remove the circlip (24), the sleeve (23), the spring (25), the washer (26) and the pinion (27).

35 Replace the springs of the 'Benada' pinion assembly (see paragraph 8, this operation).

36 Clean the parts.

Assembly (see Pl. 120 and 121).

37 Check the armature on vee blocks or between centres.

38 Check the insulation of the armature with a suitable tester.

39 Grind the commutator. Do not reduce the original diameter of 45 mm by more than 2 mm. Remove the commutator insulation after grinding by means of a saw blade thinned down to the width of the insulation or with a file.

40 Check the field coils with a test lamp..

41 Check with a 110 volt or preferably a 220 volt test lamp, the insulation of the positive brush holder (5) in relation to their bracket. If the insulation is defective, replace the assembly.

42 To connect the positive brush (8). Solder the brush wire on its coil connection using a soldering iron.

NOTE - Never use killed hydrochloric acid, but special soldering paste or resin.

43 To assemble the field coils :

a) Put on the terminal (20) the insulating washers (21) and the insulating bush (22). Fit the terminal on the starter motor. Then fix provisionally, positioning the slot of the terminal to allow the fitting of the connection.

NOTE - To ensure correct positioning of the pole pieces and coils in the body of the starter and to obtain a clearance of 0.5 mm maximum it is necessary to use a mandrel of 76.8 mm diameter.

b) Insert the field coils (19), take the precaution of fitting the ends of the connections in the slot of the terminal. Fit the pole pieces (18). Tighten the screws (17) provisionally.

c) Insert the mandrel between the pole pieces, in a press (use the mandrel MR-1601-1 with the support block MR-1601-3, see Pl. 122). Lock the screws fixing the pole pieces (use the screwdriver MR-1601-4 fitted on a bench press, see Pl. 122). Take out the mandrel from the opposite side to that from which it was put in ......

Mandrel MR-1601-1
Support block MR-1601-3
Screwdriver MR-1601-4

d) With a soldering iron, tin solder the connection and the terminal.

e) Put on the terminal (20) the two fibre washers (16), the steel washer (15). Tighten the nut (14) ....

16 mm box spanner

44 To assemble the bearing plates :

NOTE - The bearings of the bearing plates are made of porous bronze. Before assembly, soak the bearings for approximately 24 hours in a bath of engine oil, so that the bronze becomes impregnated, no further oiling should be necessary.

Put the bearings (13) in position, using a shouldered mandrel, stop driving in when the bearing is level with the outer face of the bearing plate ....

Shouldered mandrel :
Small dia. = 15.5
Length = 15
Large dia. = 18
Length = 150

45 To assembly the pinion assembly :

Screw the pinion (27) on the shaft, fit the plain washer (26), the spring (25), the sleeve (23). Lock by fitting the circlip (24). Slide the sleeve (23) up to the stop.

		TOOLS
46	Put on the armature shaft (3) the steel washer (11), a fibre washer (12), the centre bearing plate (4), the fibre washer (12), the steel washer (11).	
47	To fit the pinion assembly : Put the Woodruff key (10) in position, engage the pinion assembly (9). Tighten the grub screw (29), put the circlip (30) in position. The end play should be between 0.2 and 1.3 mm. In the contrary case, add fibre washer (12).	
48	Put the armature in the body of the starter motor.	
49	Fit the brush holder assembly (5) on the rear bearing plate (6), insert a spring washer under the head of the screw (7).	8 mm box spanner
50	Put the rear bearing plate (6) on the armature shaft (3) and put the brushes in their holder; slightly engage the rear bearing plate (6) and bring the brushes into contact with the commutator. Engage the rear bearing plate fully, (positioned by a slot and a dowel pin).	
51	Put the Bendix housing (2) on the armature (3). The position is marked by a notch which will be found on the upper part of the starter motor.	
52	Fix the Bendix housing (2) and the rear bearing end plate (6) with the screws (1). Insert a serrated washer under the nuts (31)	14 mm box spanner
53	Test the starter motor on a bench : When starting up : 180 to 200 amps. Rotating with no load: 50 to 80 amps.	
54	Paint the unit.	

		TOOLS
	REMOVAL	
1	Drain the engine cooling radiator.	
2	Remove the clip from the flexible air inlet hose and disconnect the hose from the heating and demisting radiator.	
3	Remove the heating and demisting radiator fixing screws	8 mm box spanner
4	Remove the rubber sleeve connecting the heating and demisting radiator to the air pipe.	
5	Disconnect the flexible hot water inlet pipe from the radiator. Disconnect from the radiator the lower flexible pipe for the return of the water to the engine. Remove the heating and demisting radiator.	
	REFITTING	
6	Connect to the heating and demisting radiator the flexible lower pipe for the return of water to the engine and tighten the clip. Connect the upper hot water inlet pipe and tighten the clip.	
7	Fit the rubber sleeve connecting the heating and demisting radiator to the air pipe and tighten the radiator fixing screws (plain and spring washers under the heads)	8 mm box spanner
8	Connect the flexible air inlet pipe to the heating and demisting radiators and fit the Ligarex clips (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
9	With the engine running fill the engine cooling radiator.	

ILLUSTRATIONS

INDEX OF ILLUSTRATIONS

COMPONENT	No. of Illustration	DESCRIPTION
ENGINE	1	Longitudinal section.
	2	Cross section.
	3	Assembly of valve rockers.
	4	Valve seats.
	5	Fitting the valves.
	6	Calibration of springs.
	7	Cylinder head. Sequence of tightening screws.
	8	Replacement of valve guides.
	9	Replacement of valve guides (tools).
	10	Oil pump.
	11	Adjustment of the oil pump.
	12	Fitting cylinder barrel joints.
	13	Piston and crankshaft line.
	14	Assembly of the oil seals.
	15	Setting the timing wheels.
	16	Various tools.
	17	Various tools.
	18	Stands for dismantled engine.
	19	Stand for dismantled engine-gearbox assembly.
	20	Adjustment of the position of the high pressure pump.
	21	Checking the distance between support and crossmember.
	22	Adjusting the longitudinal position of rear engine supports.
	23	Adjusting the height of rear engine supports.
	24	Adjusting the centres of rear engine supports.
	25	Spanners for adjustment of rear engine supports.
	26	Solex carburettor 34 PBIC.
	27	Accelerator control.
	28	MIOFILTER air filter.
	29	VOKES air filter.
	30	Section of GUIOT pump.
	31	Petrol pump (inspection for leaks).
	32	SEV distributor.
	33	DUCELLIER distributor.
	34	Distributor.
	35	Water pump.
	37	Water pump. Various tools.
CLUTCH	38	Assembly.
	39	Adjustment of the toggles.
	40	Adjustment of the toggles
	41	Clutch control.

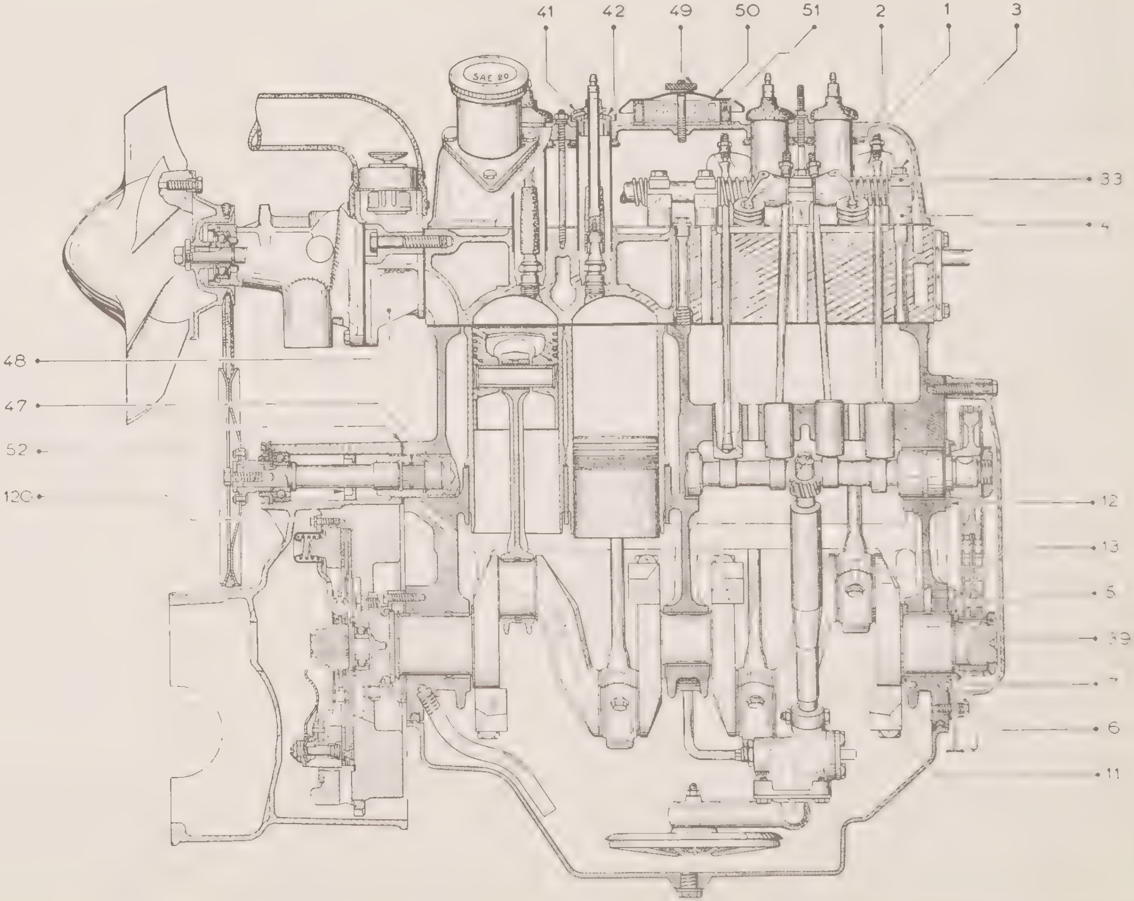
COMPONENT	No. of Illustration	DESCRIPTION
GEARBOX	42	Removal and replacement.
	43	Assembly.
	44	Shafts.
	44 A	Assembly of pinions.
	45	Differential.
	46	Cover (levers operating the selector shafts).
	47	Cover.
	48	First speed selector lever.
	49	Clutch housing.
	50	Adjustment of crown wheel and bevel pinion.
	51	Adjustment of the differential bearings.
	52	Differential bearings (extraction and fitting).
	53	Stand for gearbox for use on bench.
	54	Various tools.
	55	Various tools.
	56	Assembly of the levers operating the selector shafts.
	57	Various tools.
	58	Alignment of the pulleys.
	59	Gear change control.
	60	Gear change control.
	61	Various tools.
FRONT AXLE	62	Sections.
	62 A	Section of the upper ball joints.
	63	Various tools.
	64	Various tools.
	65	Support for half-axle.
	66	Various tools.
	67	Assembly of the seals.
	68	Assembly of the driveshaft dust cover.
	69	Adjustment of the castor angle.
REAR AXLE	70	Section of hub.
	71	Arm pivot bearing.
	72	Method of securing the arm pivot bearing.
	73	Holding the arm in a vice.
	74	Extraction of the hub brake drum.
	75	Extracting the hub bearings.
	77	Adjustment of bearing clearances.

COMPONENT	No. of Illustration	DESCRIPTION
SUSPENSION	78	Hydraulic system.
	79	Front axle suspension.
	80	Anti-roll bar and height corrector control.
	81	Rear axle assembly.
	82	Rear suspension cylinder.
	83	Manual height control gear.
	84	High pressure pump.
	84 A	High pressure pump.
	85	Pressure control valve and pressure distribution block.
	86	Height corrector - suspension cylinder.
	87	Various tools.
	88	Various tools.
	89	Sealing plugs - tapered sleeves.
STEERING	90	Assembly.
	91	Fitting the steering wheel.
	92	Various tools.
	93	Various tools.
	94	Section of the relay.
	95	Adjusting the position of a relay.
	96	Various tools.
	97	Adjustment of the pinion.
BRAKES	98	Hydraulic system for brakes.
	99	Front brake unit.
	100	Front brake unit.
	101	Tools for brakes.
	102	Rear brake backplate.
	103	Removing and fitting the return springs.
	104	Grinding the rear brake drum.
	105	Riveting the brake-cam pins.
	106	Centring the brake shoes.
	107	Pedal gear.
	108	Master cylinders.
	109	Parking brake control (mechanical)
	110	Cable adjustment.
ADJUSTMENTS	111	Lifting points on the body.
	112	Checking the camber.
	113	Pre-adjustment of the front height.

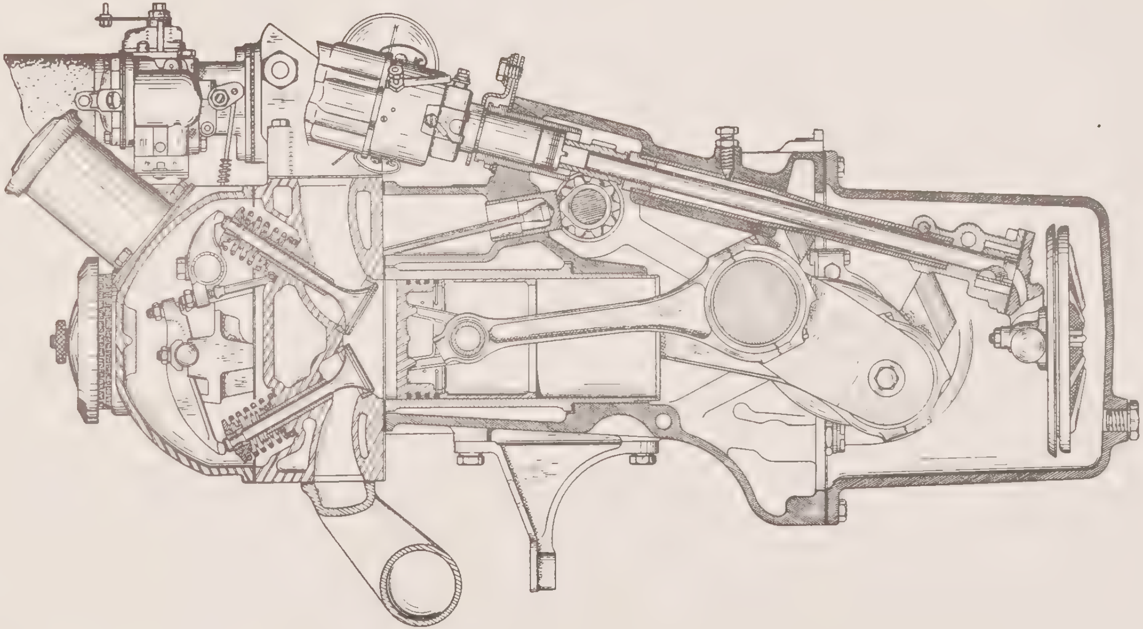
COMPONENT	No. of Illustration	DESCRIPTION
ELECTRICAL	114	DUCELLIER dynamo 7158-A.
	115	DUCELLIER dynamo 7158-A.
	116	PARIS-RHONE dynamo G11. R91.
	117	PARIS-RHONE dynamo G11. R91.
	118	DUCELLIER starter 6003-A.
	119	DUCELLIER starter 6003-A.
	120	PARIS-RHONE starter D11. B42.
	121	PARIS-RHONE starter D11. B42.
	121 A	Benada pinion.
	122	Assembly of the field coils and pole pieces.
	123	Wiring diagram.
	124	Wiring diagram.
HYDRAULIC	125	Hydraulic test bench.
	126	Hydraulic test bench.
	127	Test pipes and unions.
	128	High pressure pump. Inspection for leakage.
	129	Pressure control valve.
	130	Pressure distribution block. Inspection for leakage.of the valve settings.
	131	Pressure distribution block. Inspection of the valve settings.
	132	Main accumulator - pressure test.
	133	Pressure control valve.
	134	Suspension cylinder. Inspection for leakage.
BODY	135	Lifting the car for towing. Points of anchorage.
	136	Lifting the car for towing (details).
	137	Support for towing.
	138	Support for towing (details).
	139	Support for towing (assembly).

OPERATIONS
ID 100-3
ID 111-1
ID 112-0
ID 112-1
ID 112-4
ID 120-4
ID 120-7
ID 231-1

LONGITUDINAL SECTION



CROSS SECTION



ASSEMBLY OF THE VALVE ROCKERS

Fig. 1

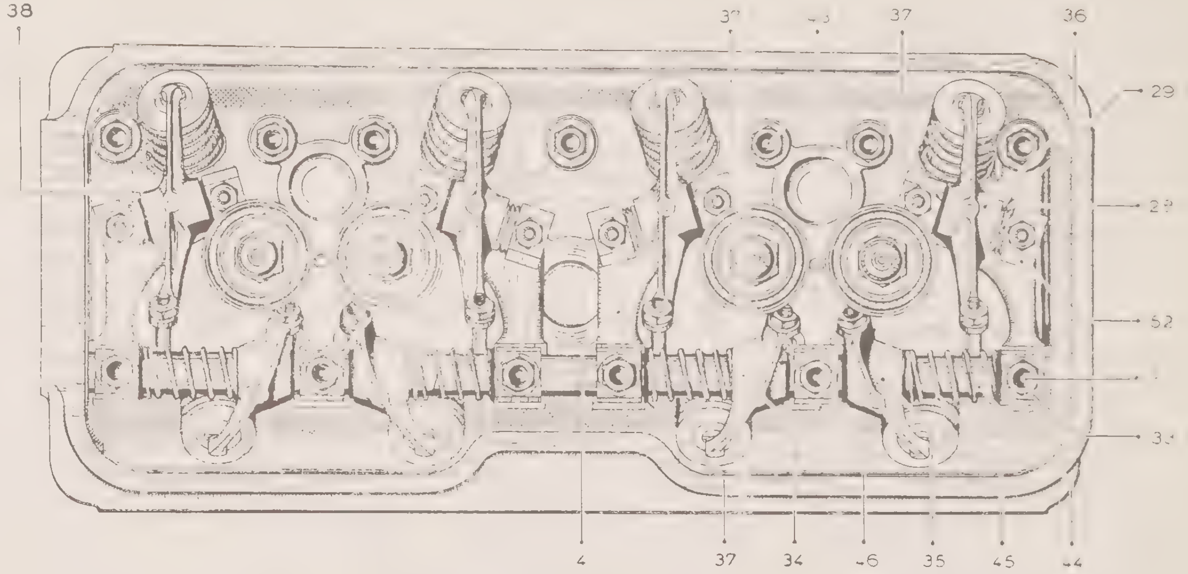


Fig. 2

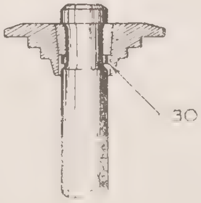


Fig. 3

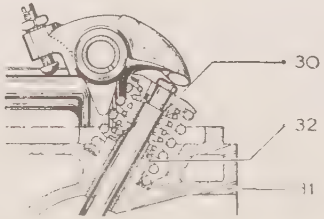
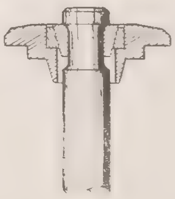


Fig 4



VALVE SEATS

Fig. 1 EXHAUST VALVE SEAT

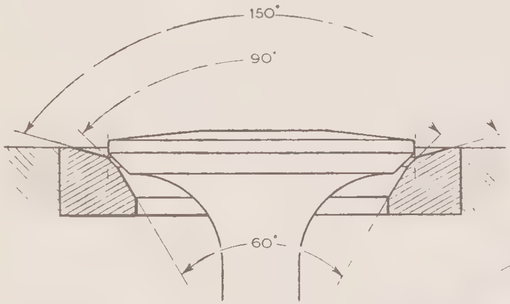


Fig. 2 INLET VALVE SEAT

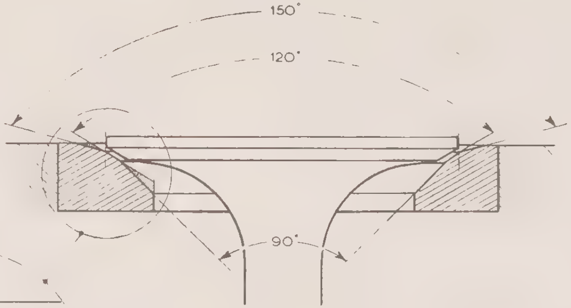


Fig 3

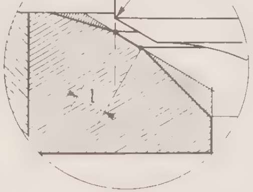


Fig . 6

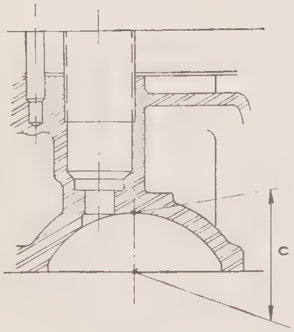


Fig. 4 VALVE GRINDING TOOL sold under No 1615-T

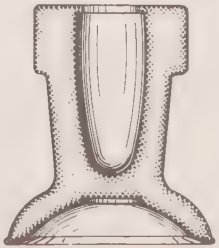
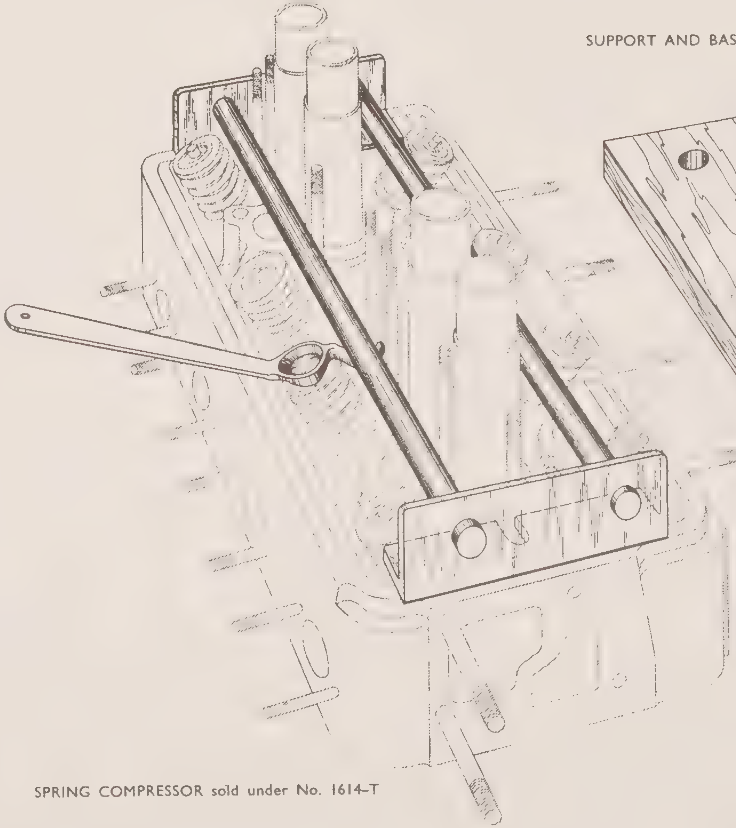


Fig. 5 TABLE OF GRINDING WHEELS

Seats to be Ground	Use of Wheel	Angle	Description of Grinding Wheel
INLET	Valve seat	120°	Single cone 44 dia. 1662–T
	For top clearance	150°	Biconical 44 dia. 1630–T
	For lower clearance	90°	
EXHAUST	Valve seat	90°	Biconical 40 dia. 1627–T
	For top clearance	150°	Single cone 40 dia. 1633–T
	For lower clearance	60°	

FITTING THE VALVES

Fig 1



SPRING COMPRESSOR sold under No. 1614–T

Fig. 2

SUPPORT AND BASE ASSEMBLY sold under No. 1616–T

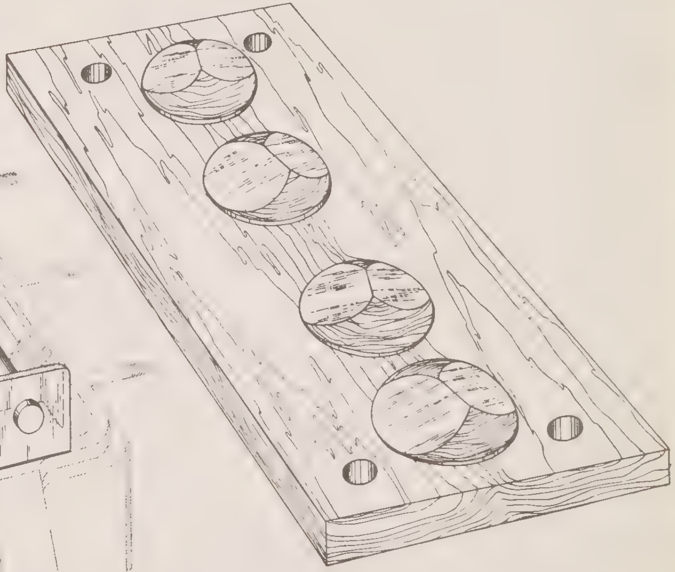
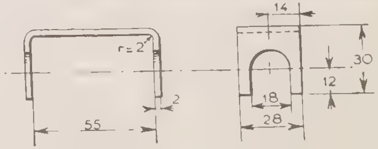


Fig 3 RETAINER MR–4158–20, not sold



CALIBRATION OF SPRINGS

1. CHECKING THE FREE LENGTH OF A SPRING

PLACE THE SPRING TO BE CHECKED (1) IN THE TWO GUIDES (2). BY HAND BRING THE SLIDE (3) INTO CONTACT WITH IT. THE INDEX MARK (4) IS NOW OPPOSITE THE FIGURE ON THE SCALE (5) (LENGTH) SHOWING THE FREE LENGTH OF THE SPRING (1).

2. CHECKING THE LENGTH UNDER LOAD

A) PLACE THE CALIBRATED SPRING (6) (OR 12 AS THE CASE MAY BE) IN THE TWO HOLES (a) AND BRING THE SLIDE (8) INTO CONTACT WITH IT BY TURNING THE HAND WHEEL.

B) BY THE HAND-WHEEL (9) BRING THE SPRING (1) TO BE CHECKED TO THE LENGTH UNDER LOAD SHOWN IN THE TEXT. READ THIS LENGTH OPPOSITE THE INDEX MARK (4) ON THE SCALE OF LENGTH (5).

C) READ ON THE SCALE (10 (load in kg) OPPOSITE THE INDEX MARK 11 IF USING THE CALIBRATED SPRING (6))
(14 (load in kg) OPPOSITE THE INDEX MARK 13 IF USING THE CALIBRATED SPRING (12))
THE CORRESPONDING LOAD.

Fig. 1 — FIXTURE FOR CALIBRATING SPRINGS

sold under No.2420-T

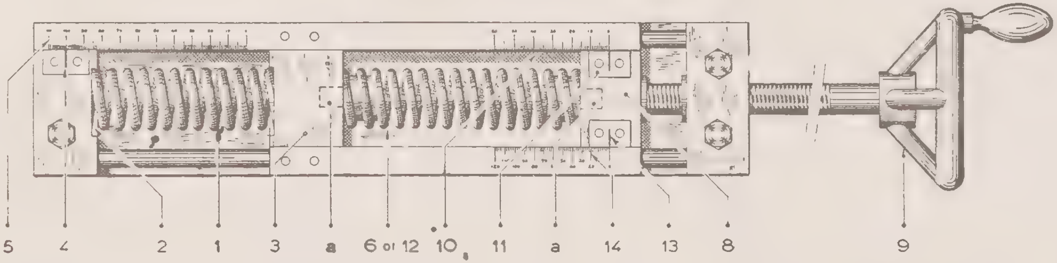


Fig. 2 — CALIBRATED SPRINGS

SPRING DEFLECTING 1 mm per KG

sold under No.2421-T

This spring is painted yellow

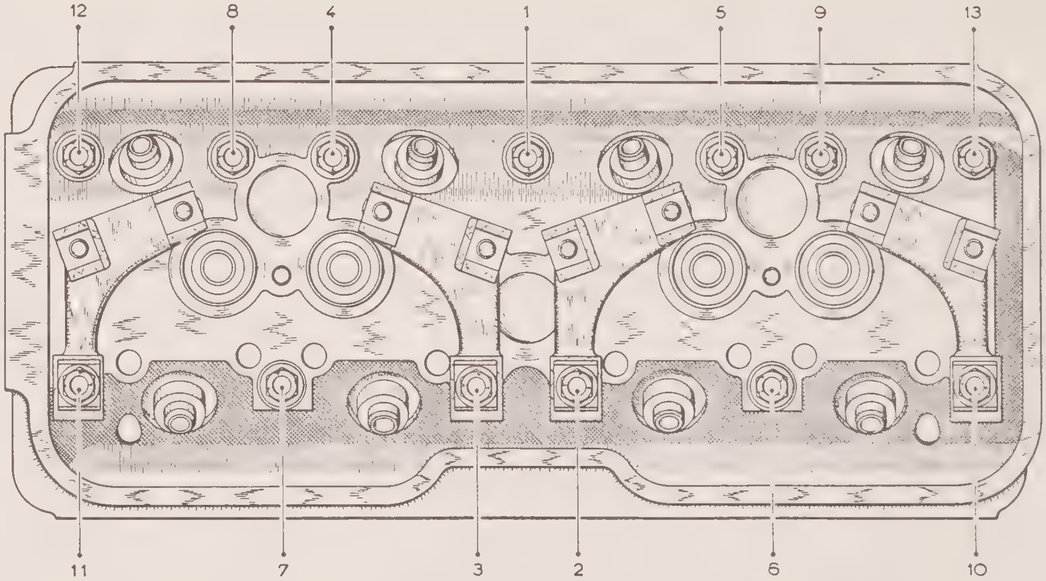
SPRING DEFLECTING 1 mm per 2 KG

sold under No.2422-T

This spring is painted red

CYLINDER HEAD

Fig. 1 — SEQUENCE OF TIGHTENING SCREWS



TENSION OF TIGHTENING (COLD). 1st TIGHTENING 21.75 FT./LBS. (3 M/KG). 2nd TIGHTENING 43.5 FT/LBS. (6 M/KG)

IT IS ADVISABLE TO TIGHTEN THE SCREWS IN THE ORDER INDICATED ABOVE. THE TENSION OF TIGHTENING IS OF THE GREATEST IMPORTANCE AND THE USE OF A TORSION SPANNER WITH A 12.7 SOCKET IS INDISPENSABLE (SOLD UNDER No.2465–T).

NSABLE

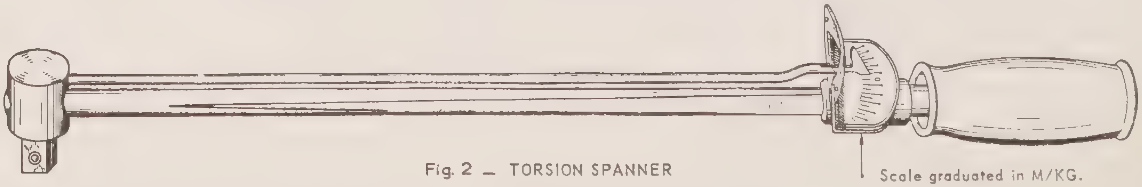


Fig. 2 — TORSION SPANNER

sold under No.2471–T

REPLACEMENT OF THE VALVE GUIDES

Fig 1 _ EXTRACTING A GUIDE

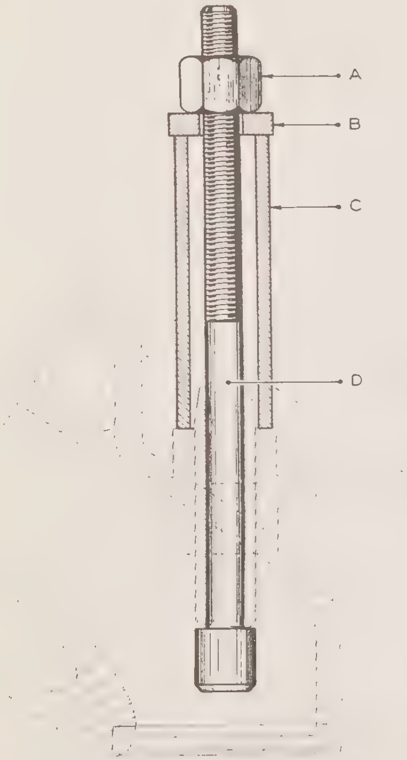


Fig. 2 _ FITTING AN INLET VALVE GUIDE

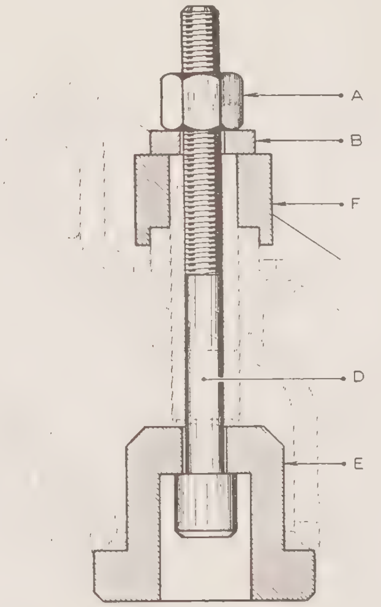
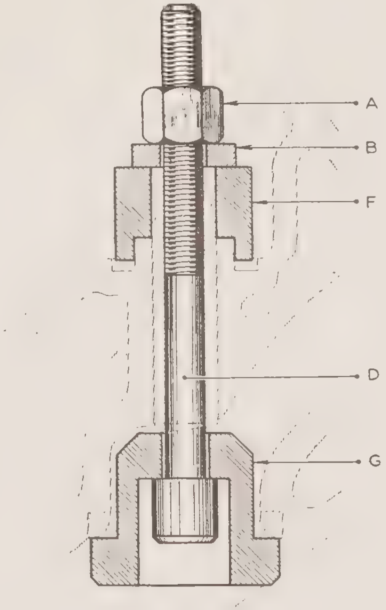


Fig. 3 _ FITTING AN EXHAUST VALVE GUIDE



TOOLS

sold under No.1644–T

REPLACEMENT OF THE VALVE GUIDES

Fig. 1 _ TOOLS GE

sold under No.1644-T

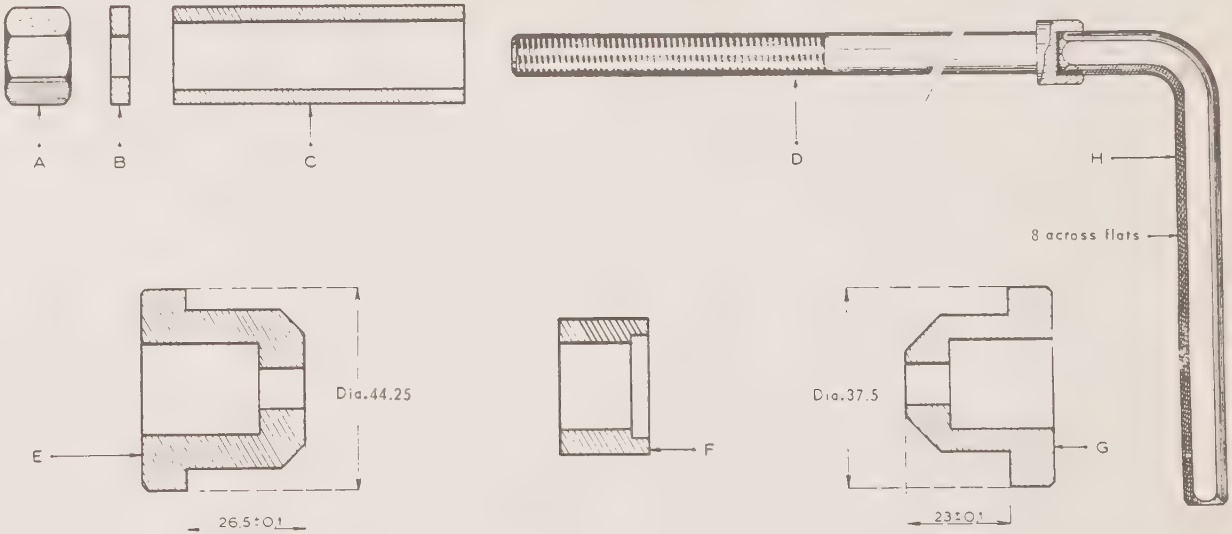
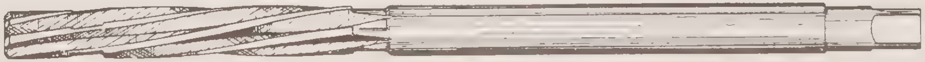


Fig. 2 _ REAMER

sold under No.1642-T



OIL PUMP

Fig. 1

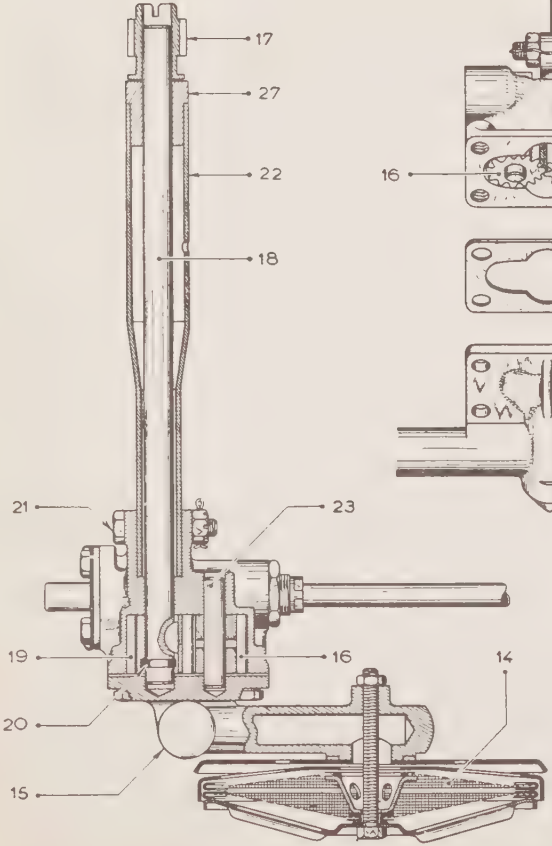


Fig. 2

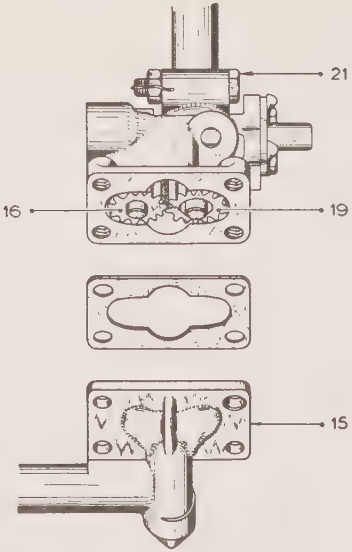


Fig. 3

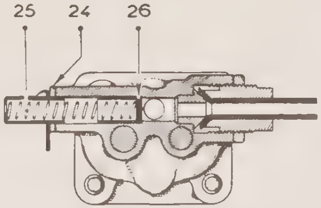
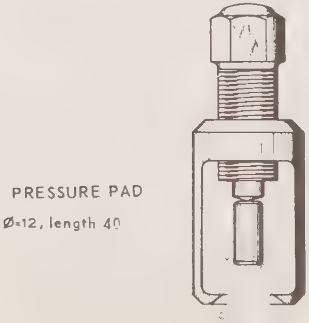


Fig. 4 — EXTRACTOR

sold under No.1964-T



ADJUSTMENT OF THE OIL PUMP

Fig. 1 — SIMPLIFIED ASSEMBLY MR.1811

not sold

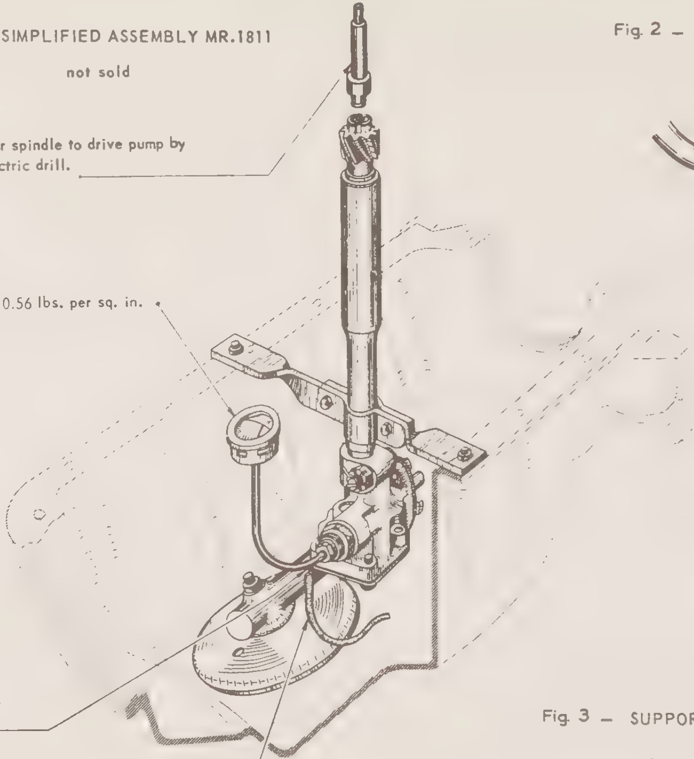
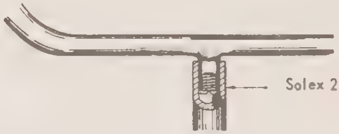
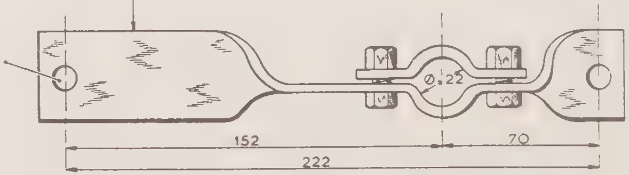

Use a distributor spindle to drive pump by means of an electric drill.
Pressure gauge 0.56 lbs. per sq. in.
Pipe with restrictor jet
Rubber tube in the oil

Fig. 2 — ASSEMBLY OF RESTRICTOR JET



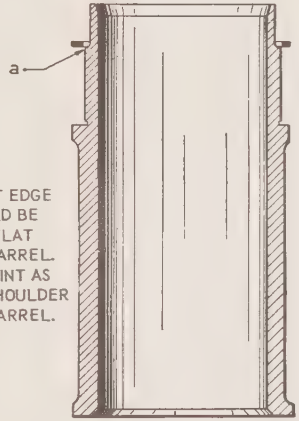
WITH OIL OF SAE 20 VISCOSITY WARMED TO 60° 50° C THE PRESSURE SHOULD BE 50 LBS. PER SQ. IN. (3.5 KG/CM2) AT 1000 R.P.M. IF THIS PRESSURE IS NOT OBTAINED CHANGE THE SPRING 25. SEE PLATE 10.

Fig. 3 — SUPPORT FOR PUMP



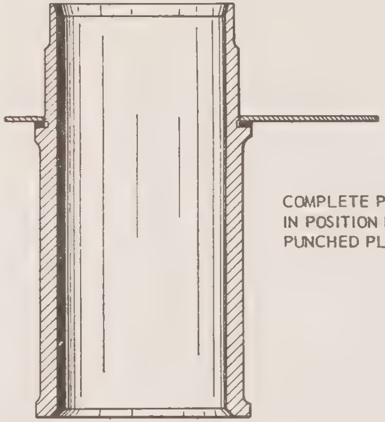
FITTING CYLINDER BARREL JOINTS

Fig. 1



NOTE: THE STRAIGHT EDGE OF THE JOINT SHOULD BE PARALLEL TO THE FLAT ON THE CYLINDER BARREL. BY HAND FIT THE JOINT AS FAR AS THE FIRST SHOULDER ON THE CYLINDER BARREL.

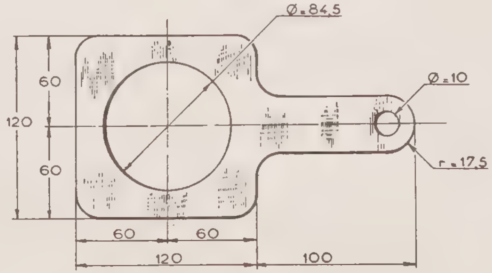
Fig. 2



COMPLETE PUTTING THE JOINT IN POSITION BY MEANS OF THE PUNCHED PLATE MR.4134.

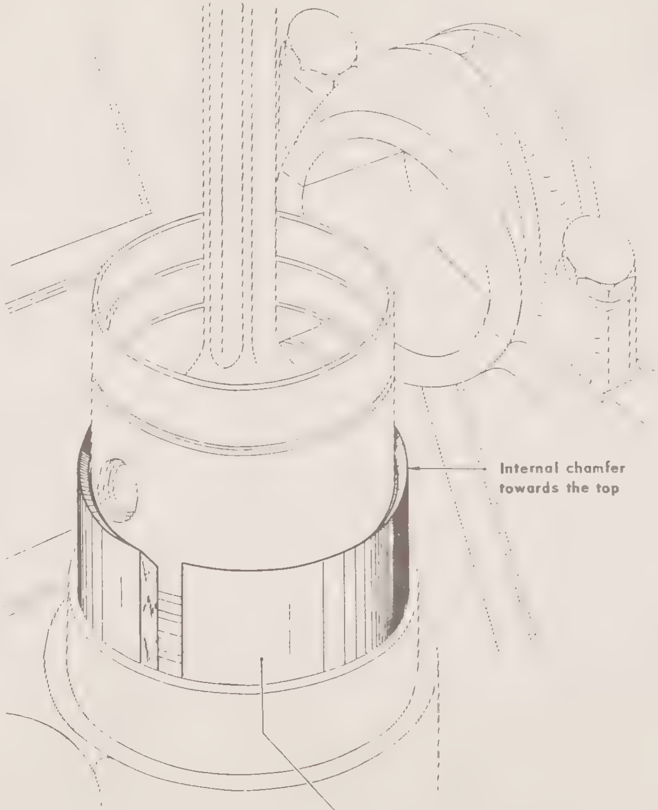
Fig. 3 – PUNCHED PLATE MR–4134

not sold



PISTON AND CRANKSHAFT LINE

Fig. 1 – METHOD OF USING RING CLIP



Internal chamfer towards the top

CLIP FOR PISTON RINGS
sold under No.1656–T

Fig. 2 – RECTIFICATION OF A CAST BEARING

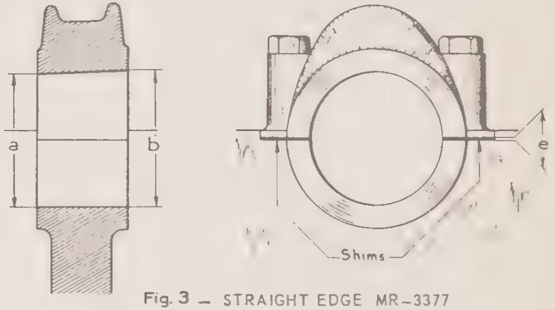
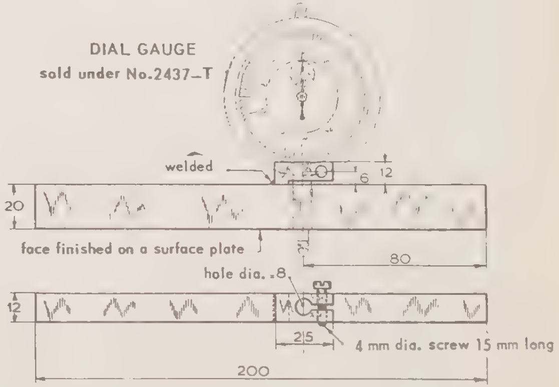


Fig. 3 – STRAIGHT EDGE MR–3377
not sold



DIAL GAUGE
sold under No.2437–T

face finished on a surface plate

4 mm dia. screw 15 mm long

ASSEMBLY OF THE OIL SEALS

Fig. 1

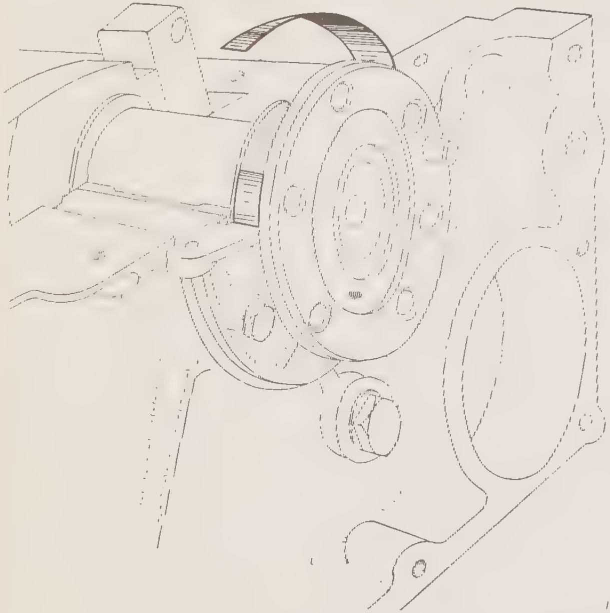


Fig. 2

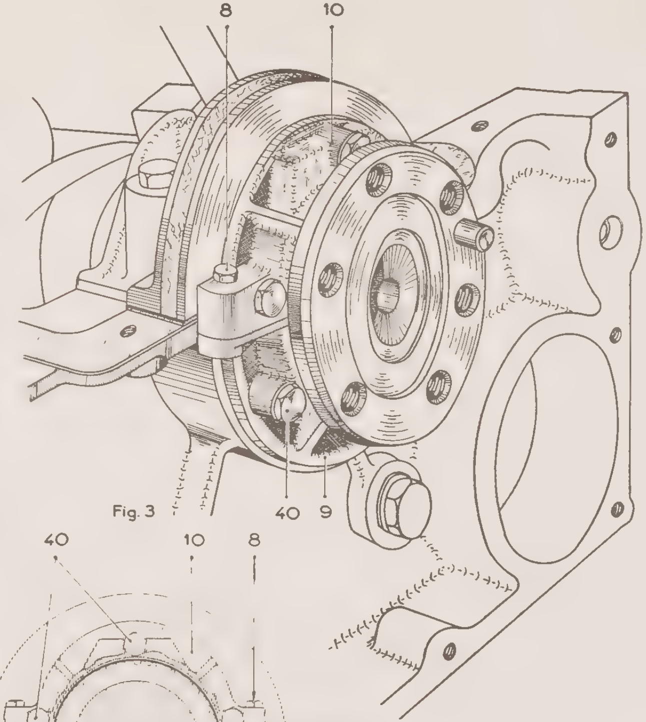
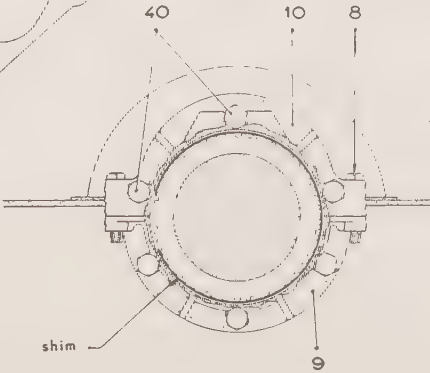


Fig. 3

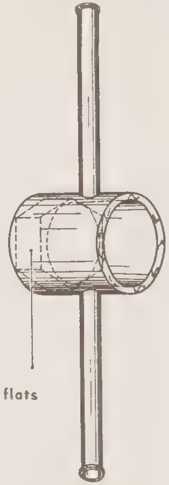


THE ENDS OF THE SHIM MUST NOT EXTEND UP TO THE ASSEMBLY FACE OF THE HALF-SHELLS.

SETTING THE TIMING WHEELS

Fig. 1 _ SPANNER

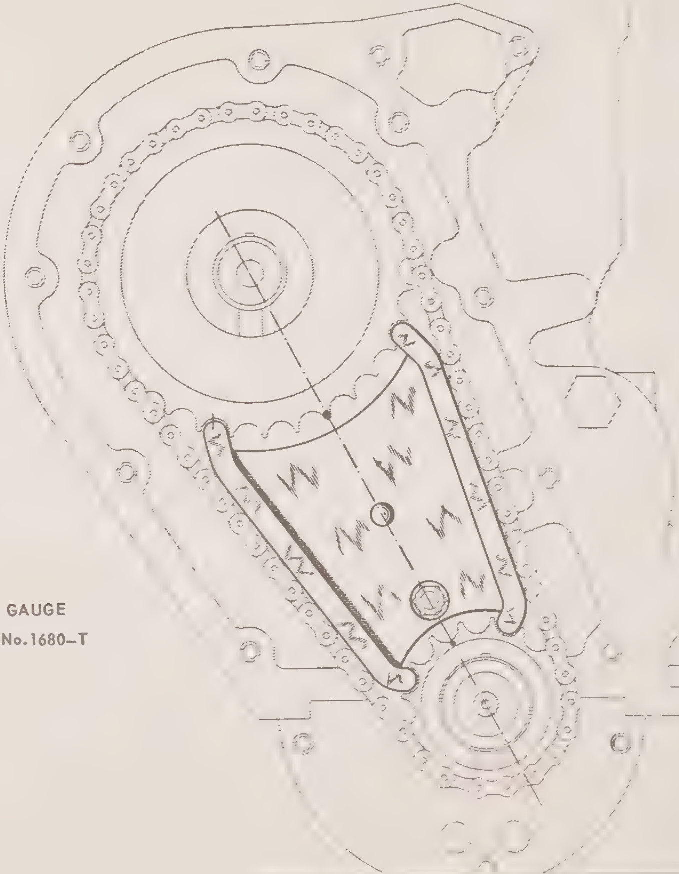
sold under No.1667-T



hexagon

46.3 across flats

Fig. 2 _ POSITION OF TIMING MARKS

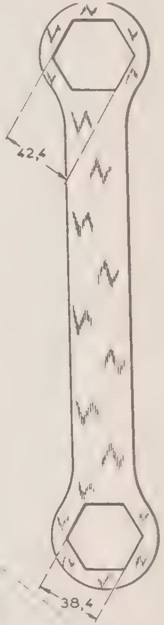


SETTING GAUGE

sold under No.1680-T

Fig. 3 _ SPANNER

sold under No.1731-T



VARIOUS TOOLS

Fig. 1 — RETAINING CLIP MR-4158

not sold

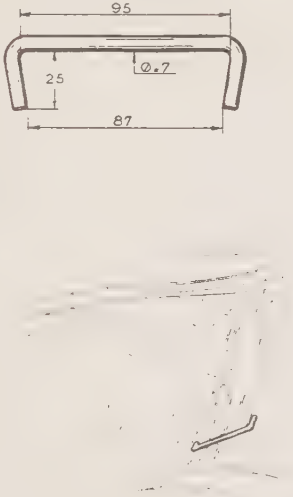


Fig. 2 — SPANNER MR-3462-70

not sold

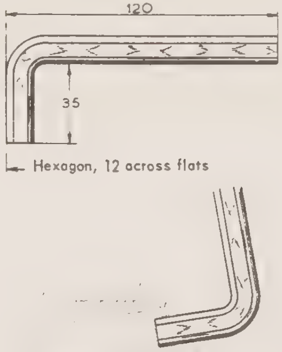


Fig. 3 — SPANNER

sold under No.1645-T

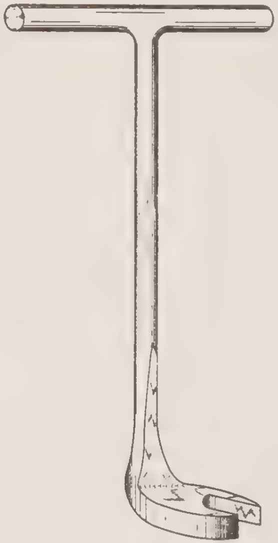


Fig. 4 — SPANNER

sold under No.1603-T

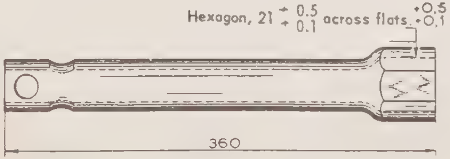


Fig. 5 — UNION SCREW MR-3705

not sold

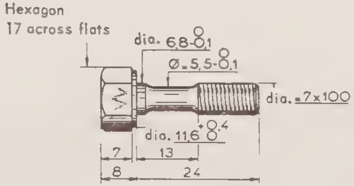
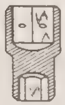


Fig. 6 — SOCKET

sold under No.1624-T



VARIOUS TOOLS

Fig. 1 — EXTRACTOR

sold under No.1608–T

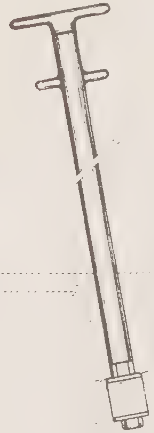
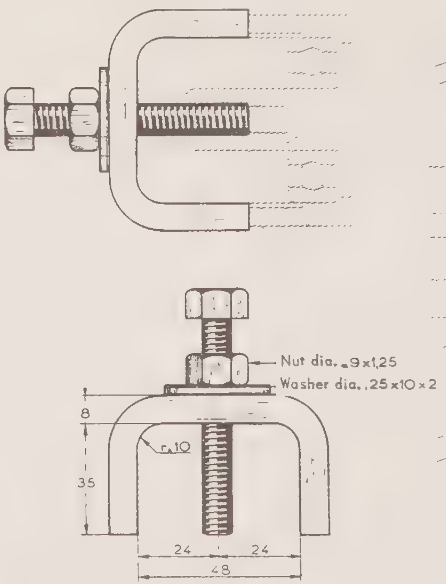


Fig. 3 — EXTRACTOR MR–3404–20

not sold



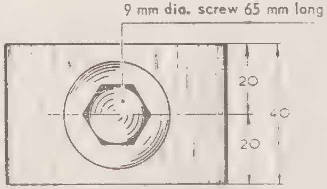


Fig. 4 — METHOD OF USING THE RING MR–4244

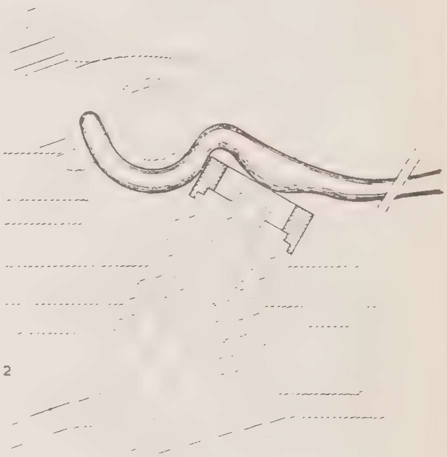


Fig. 2 — LIGAREX PLIERS

sold under No.2483–T

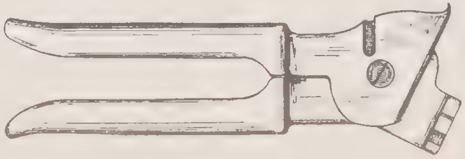
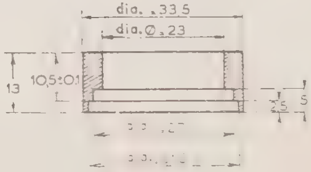


Fig. 5 — RING MR–4244

not sold



STANDS FOR DISMANTLED ENGINE

Fig. 1 _ STAND MR.3053-170

not sold

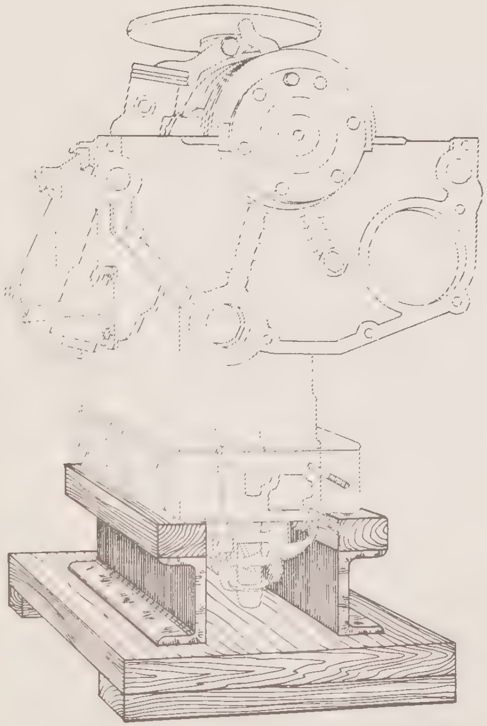
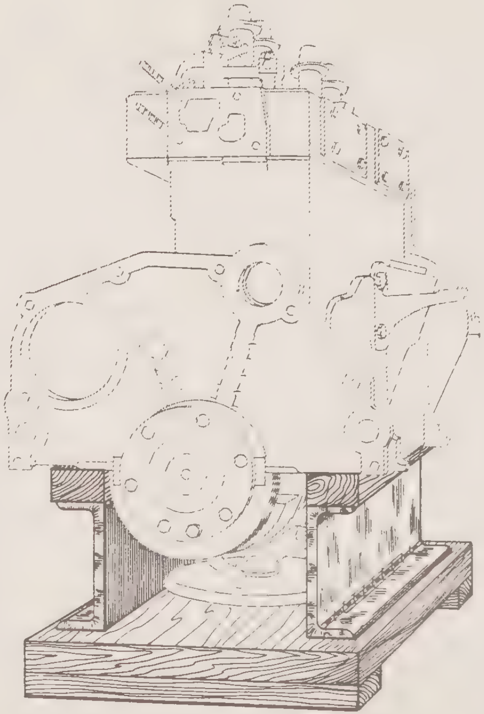


Fig. 2 _ STAND MR.3053-160 -160

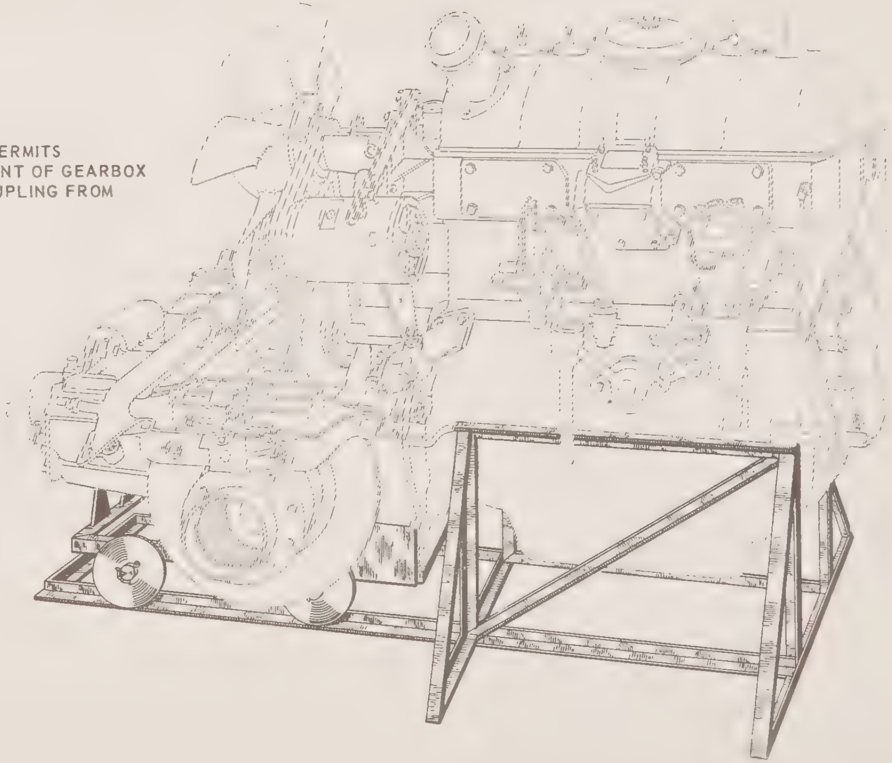
not sold



FOR CONSTRUCTIONAL DIMENSIONS APPLY TO THE SERVICE DEPARTMENT

STAND FOR DISMANTLED ENGINE GEARBOX ASSEMBLY

THE TRUCK PERMITS DISENGAGEMENT OF GEARBOX AFTER UNCOUPLING FROM THE ENGINE.



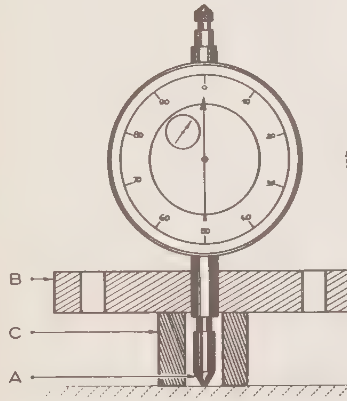
STAND AND TRUCK

sold under No.2497–T

OPERATIONS
ID 111- 0
ID 391-1

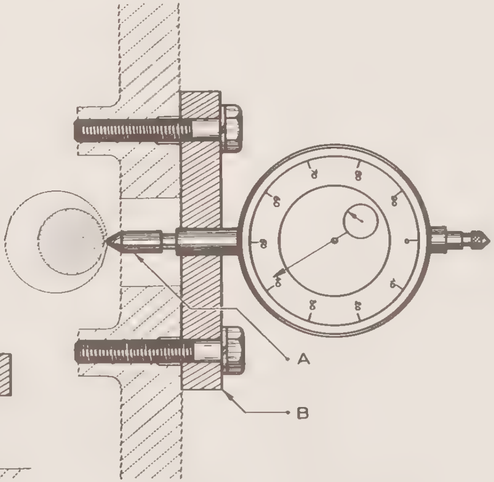
ADJUSTMENT OF THE POSITION OF THE HIGH PRESSURE PUMP

Fig. 1 _ SETTING THE DIAL GAUGER



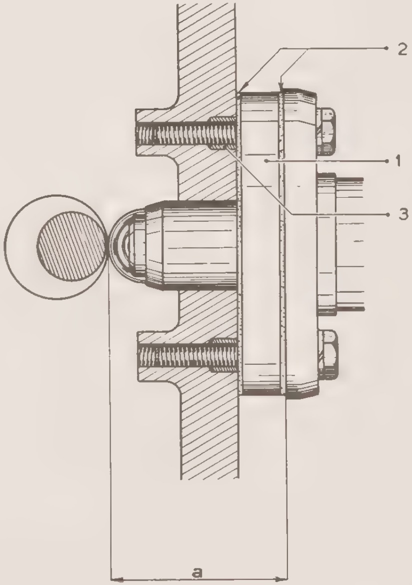
TOOL
sold under No.1693–T

Fig. 2 _ TAKING THE MEASUREMENT ON THE CYLINDER BLOCK

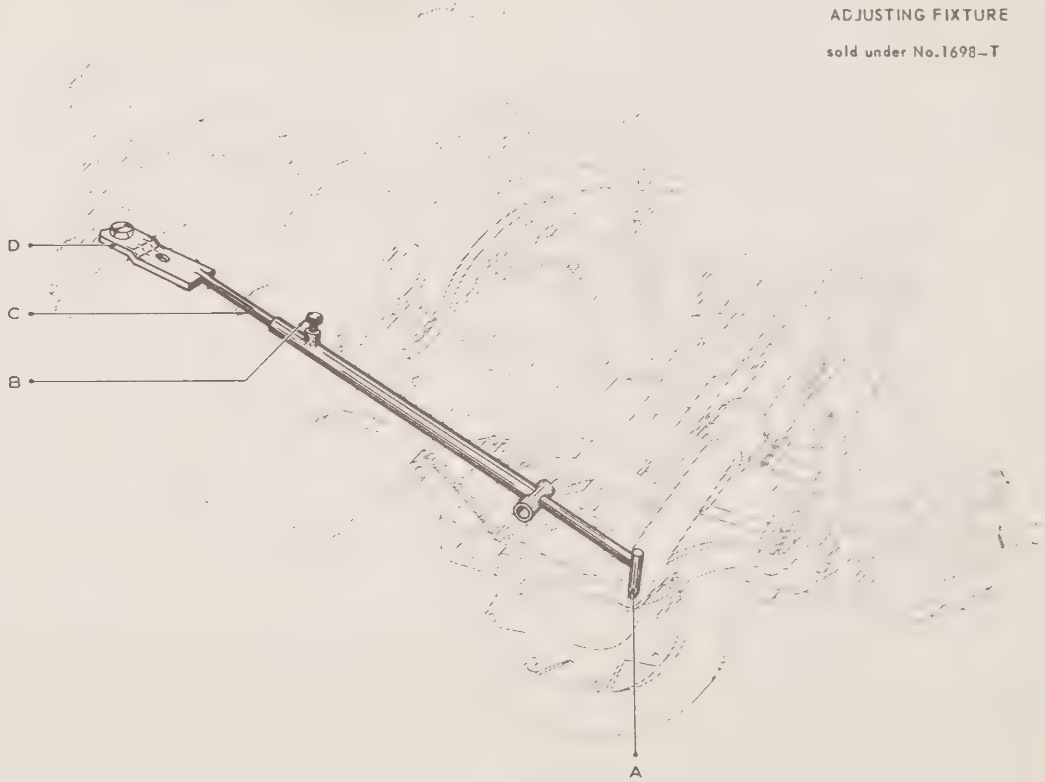


DIAL GAUGE
sold under No.2437–T

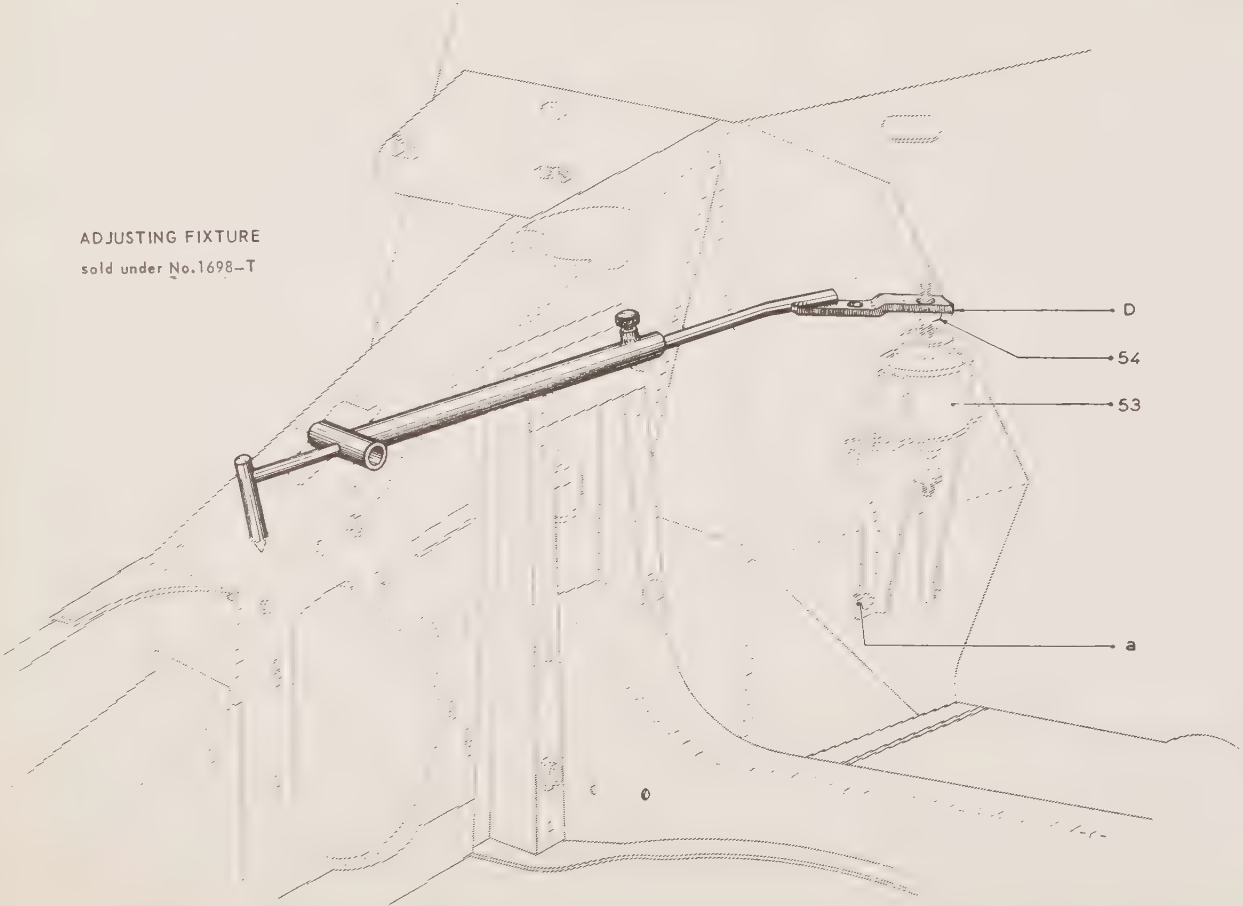
Fig. 3 _ FITTING THE PUMP ON THE CYLINDER BLOCK



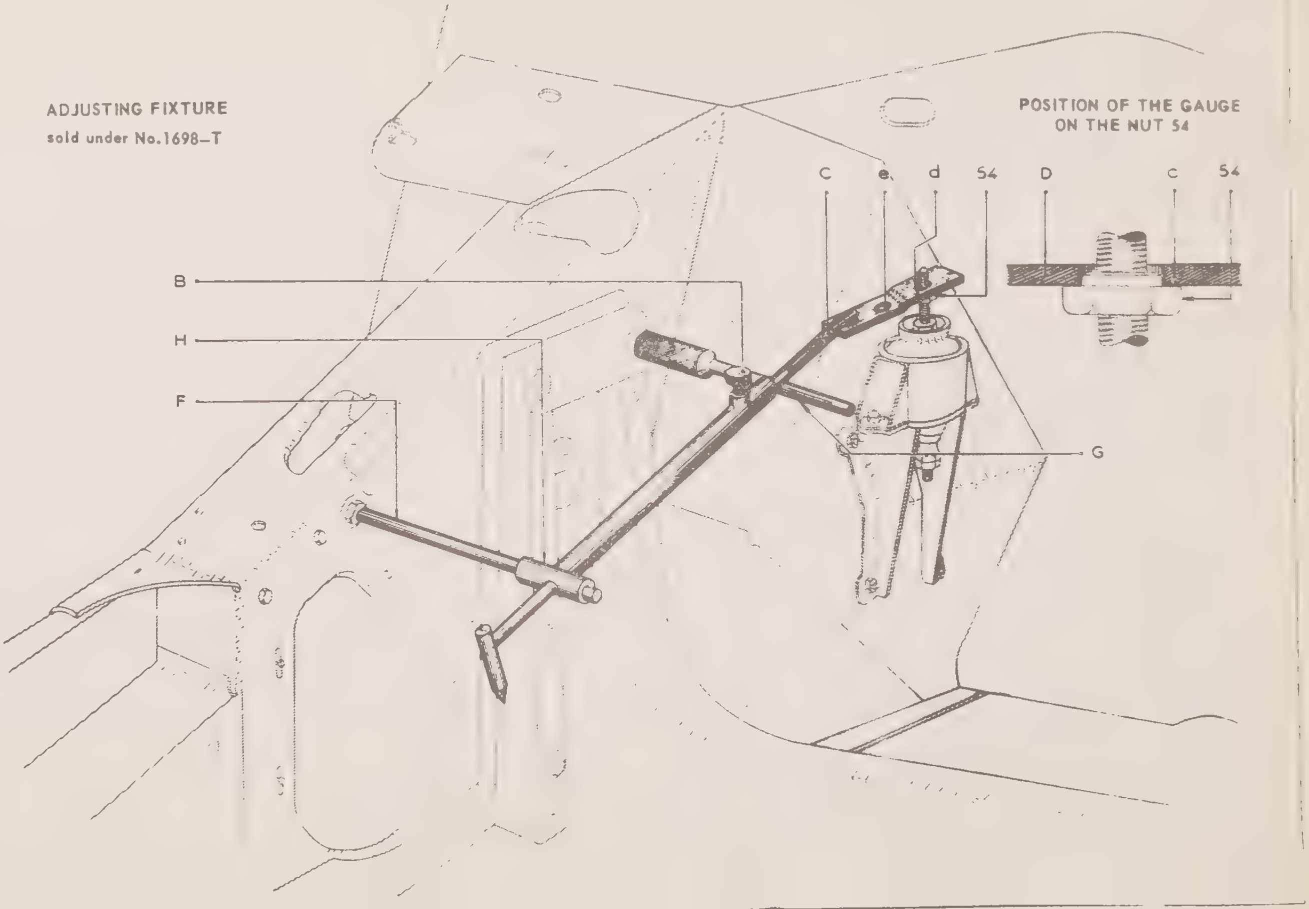
CHECKING THE DISTANCE BETWEEN SUPPORT AND CROSSMEMBER



ADJUSTING THE LONGITUDINAL POSITION OF REAR ENGINE SUPPORTS



ADJUSTING THE HEIGHT OF THE REAR ENGINE SUPPORTS



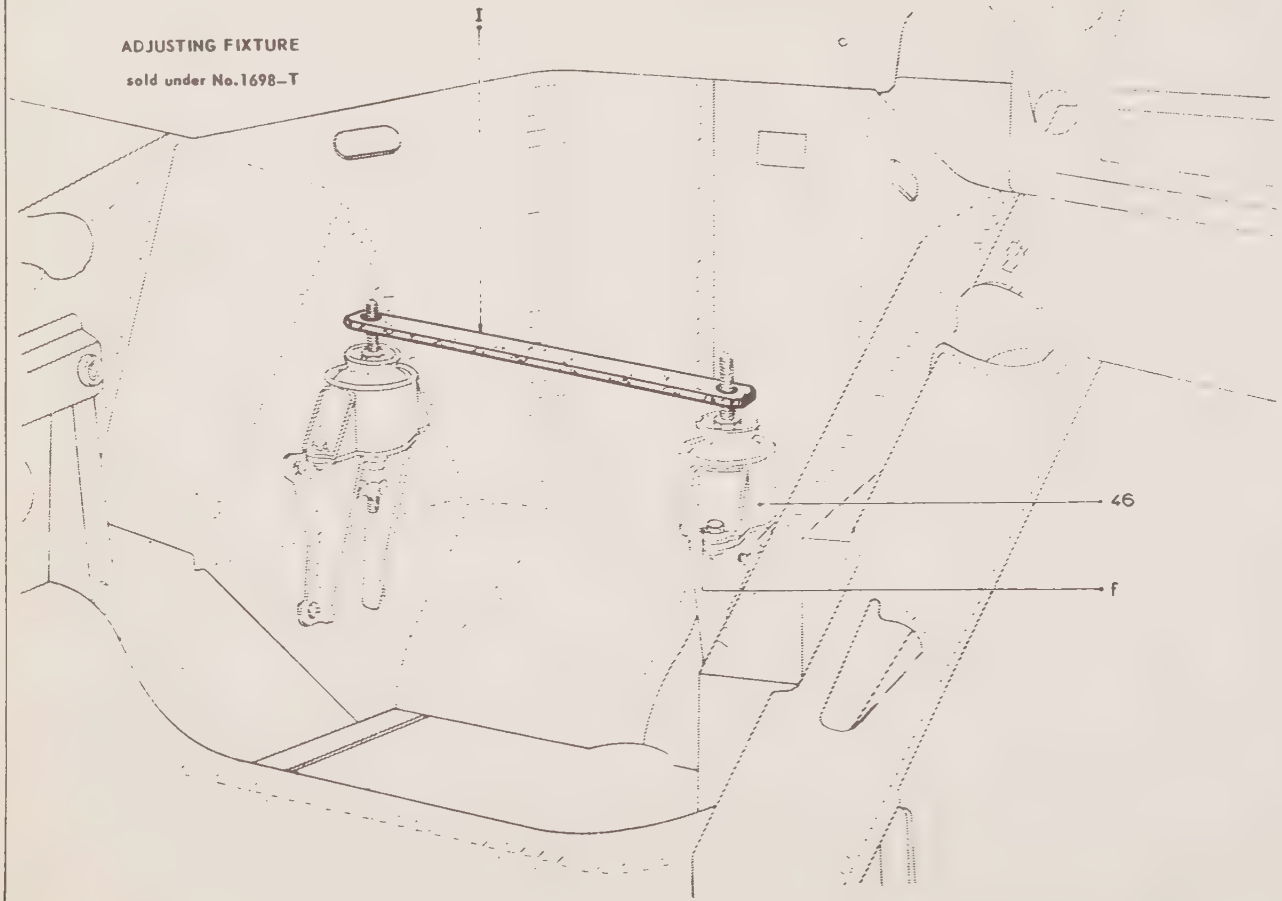
ADJUSTING FIXTURE
sold under No.1698–T

POSITION OF THE GAUGE
ON THE NUT 54

ADJUSTING THE CENTRES OF THE REAR ENGINE SUPPORTS

ADJUSTING FIXTURE

sold under No.1698–T



SPANNERS FOR ADJUSTMENT OF REAR ENGINE SUPPORTS

Fig. 1

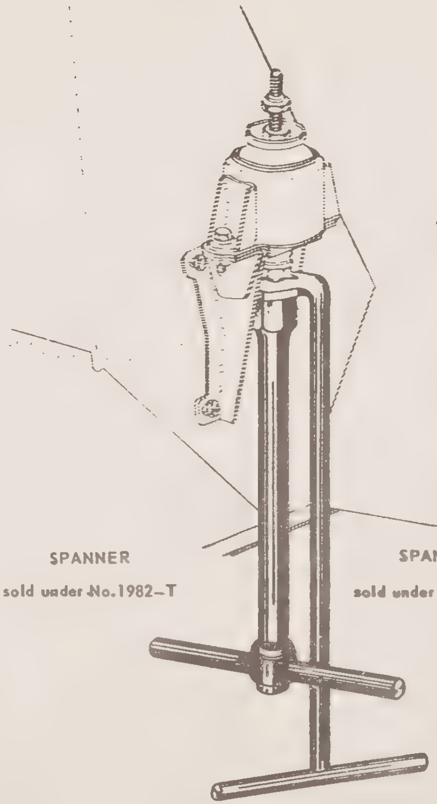


Fig. 2

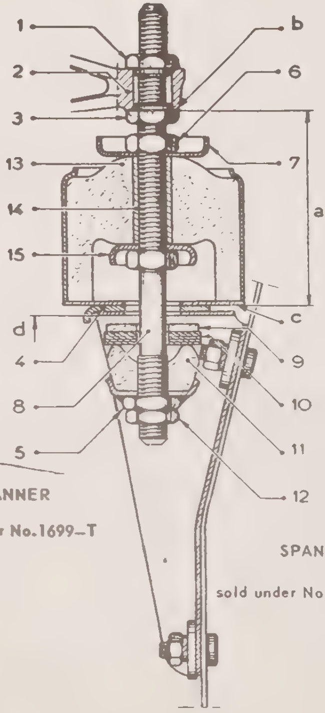
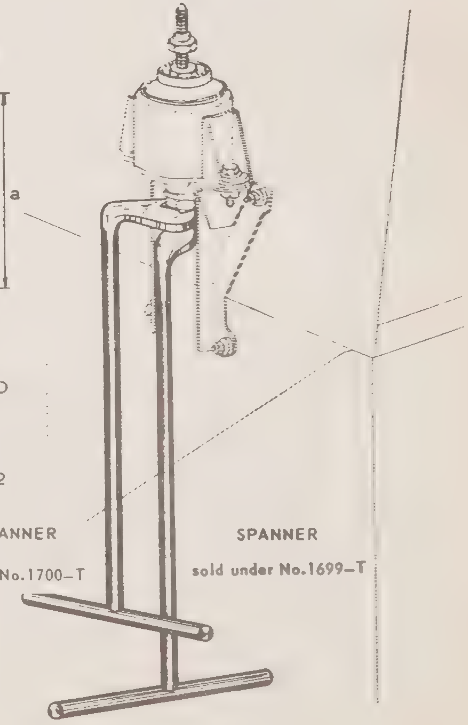
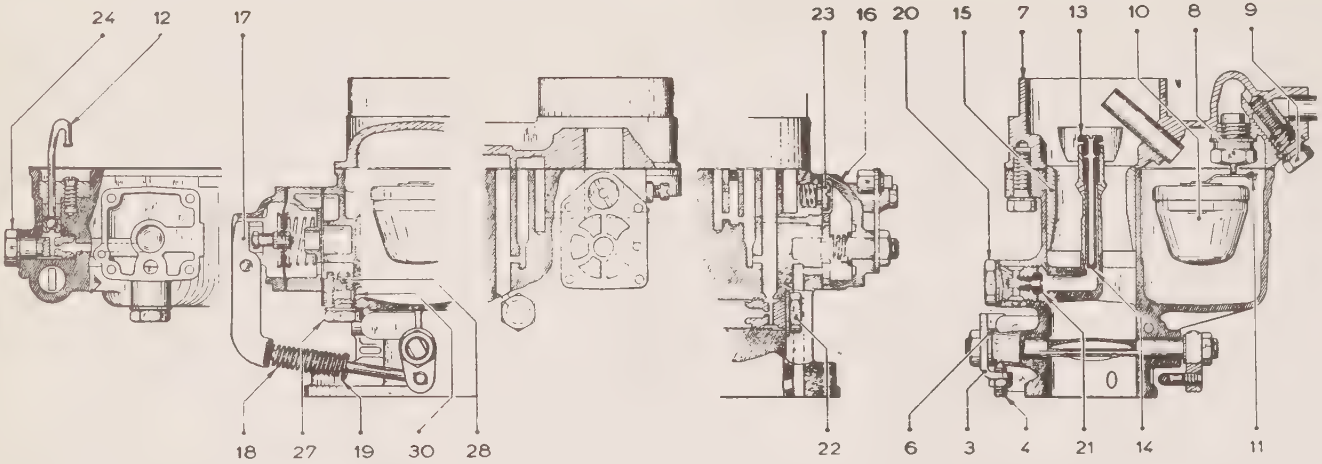
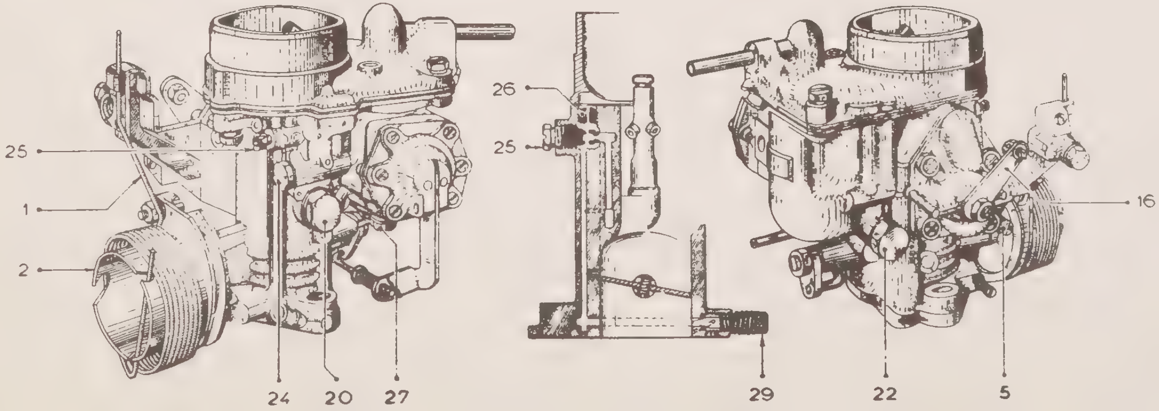


Fig. 3



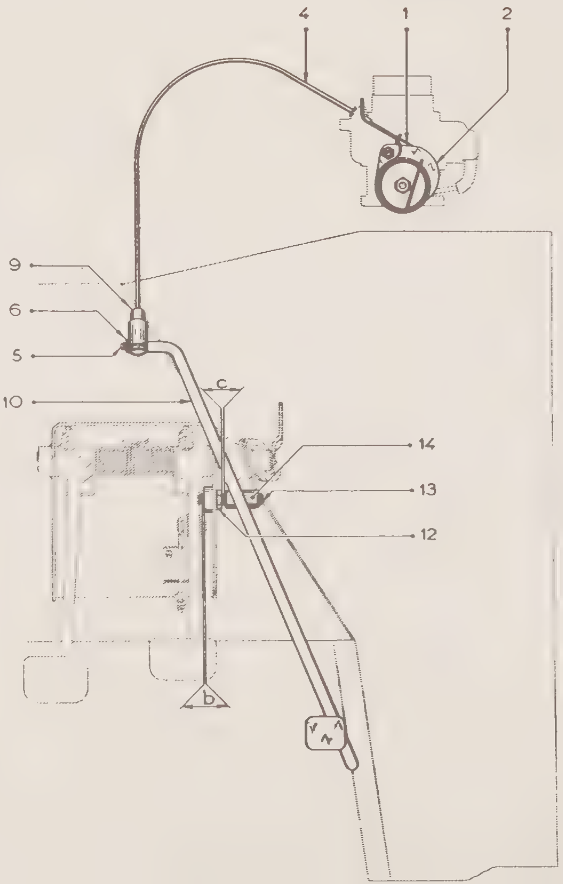
SOLEX 34 PBIC

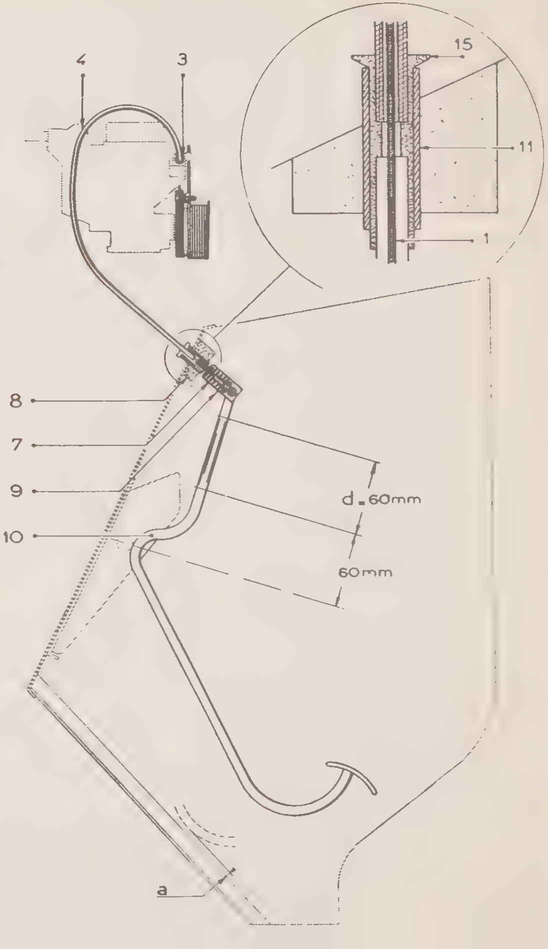




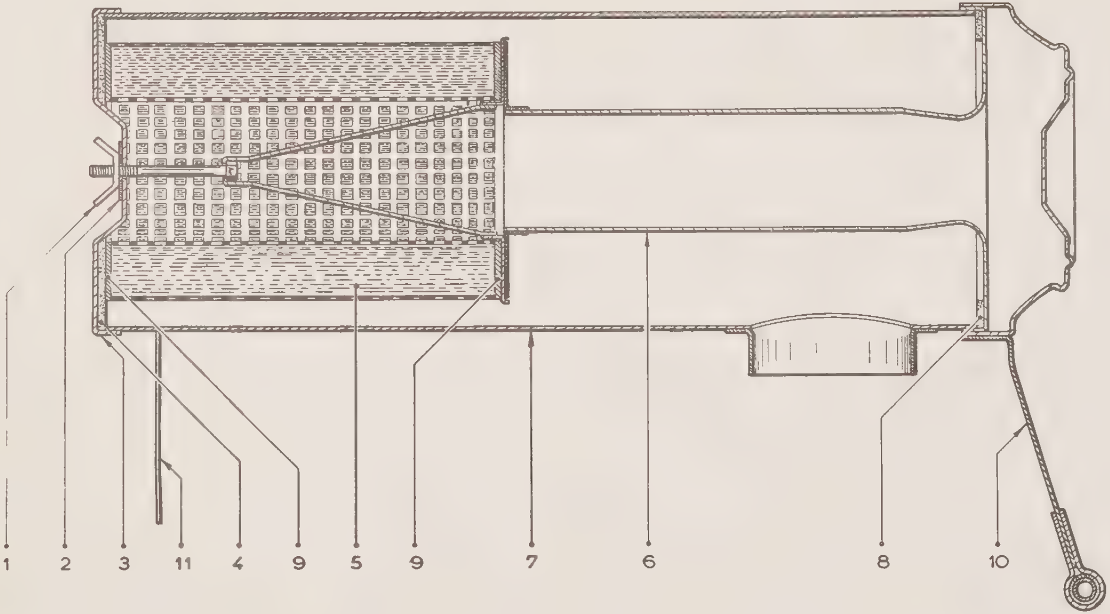
OPERATIONS
ID 142-4
ID 453-6

ACCELERATOR CONTROL

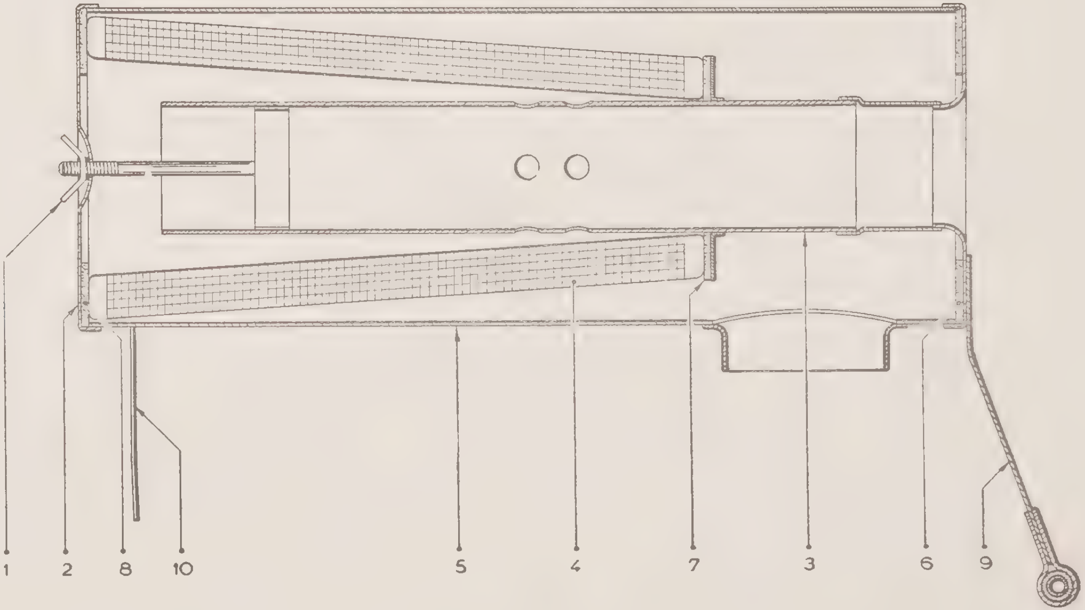




"MIOFILTRE" AIR FILTER



"VOKES" AIR FILTER



SECTION OF GUIOT PUMP

Fig 1

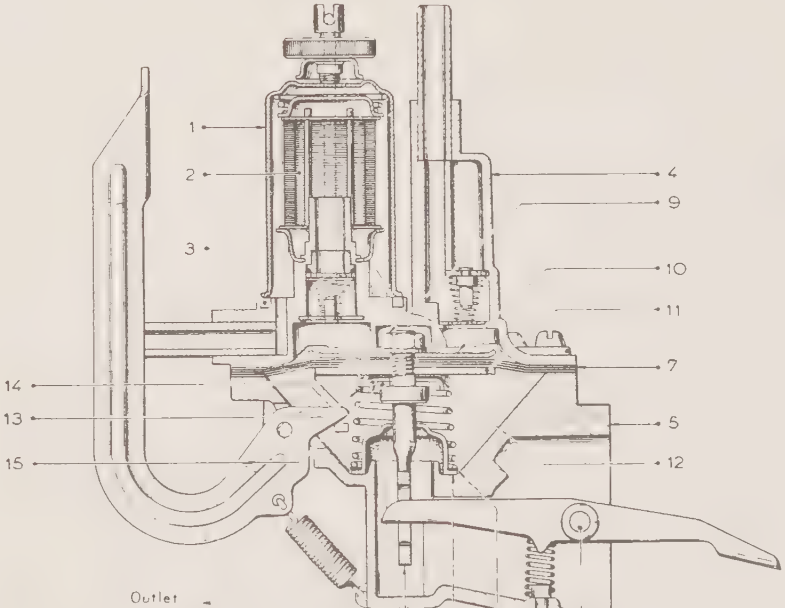


Fig 2

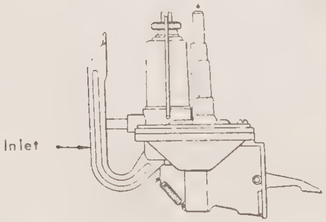
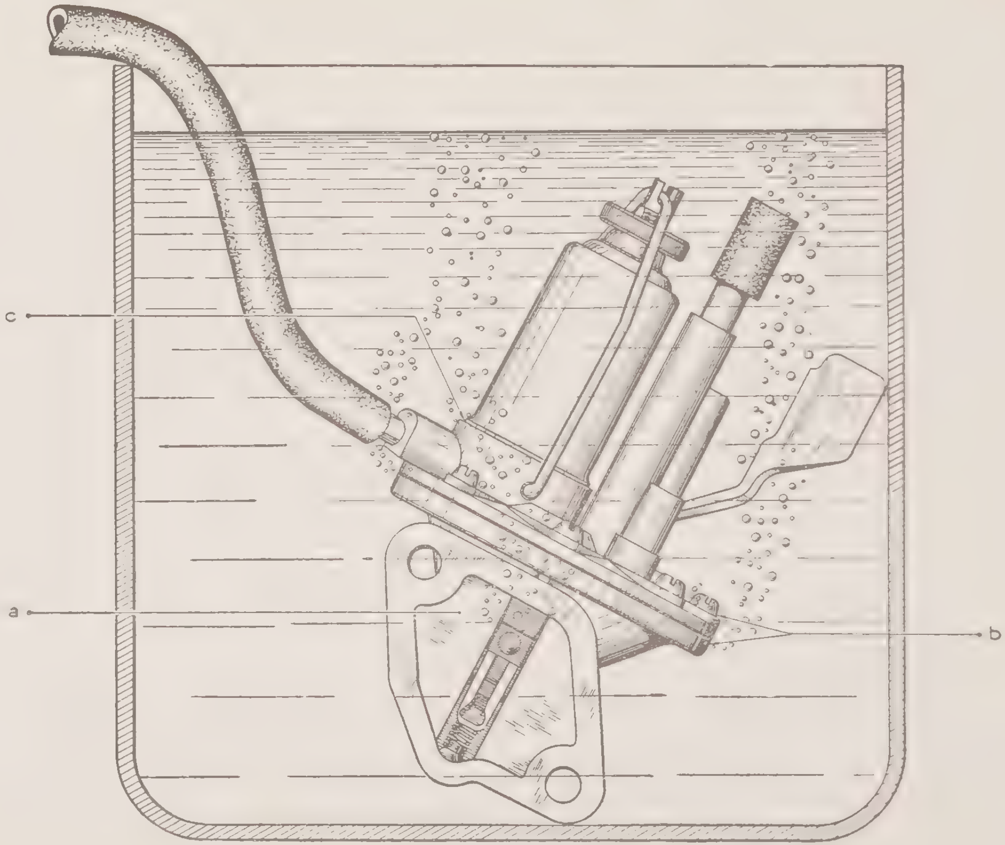


Fig 3

INSPECTION FOR LEAKS



S.E.V. DISTRIBUTOR

Fig 1

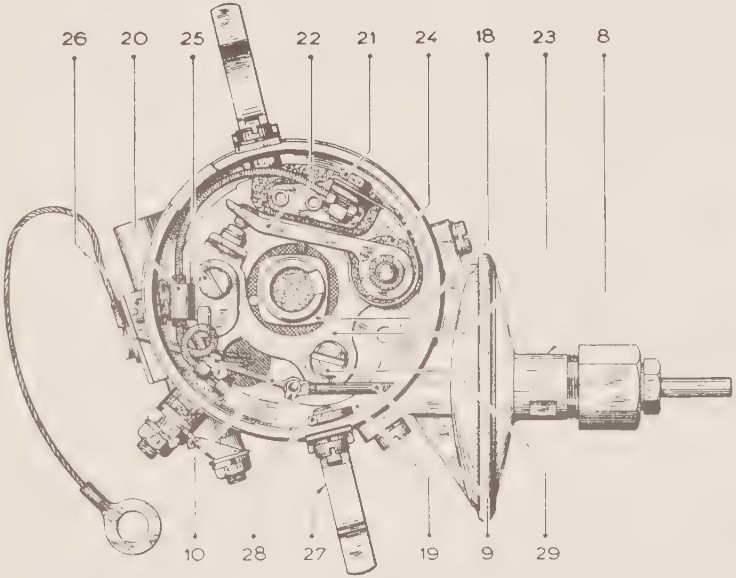


Fig. 2

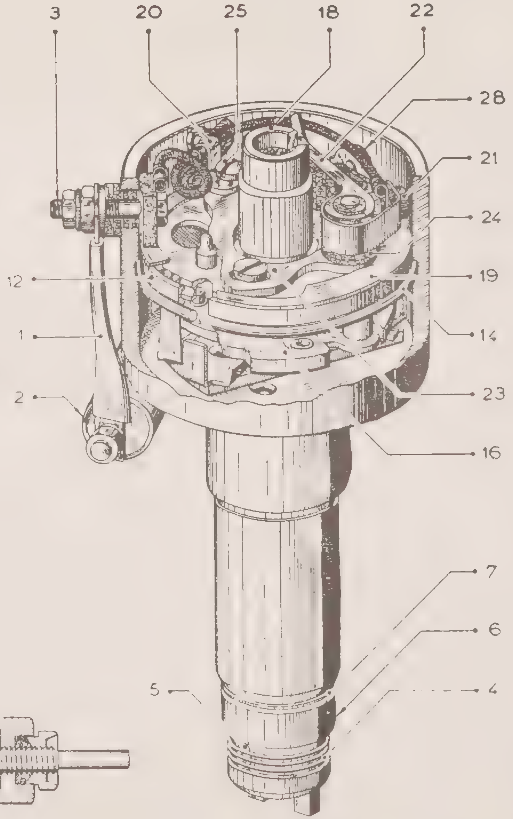


Fig 3

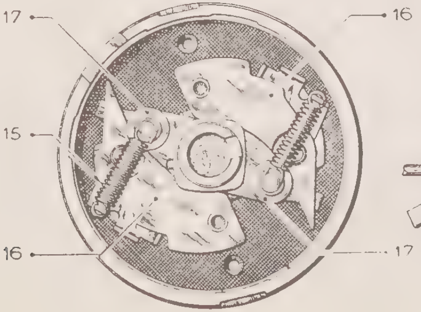
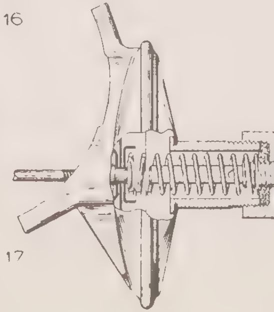
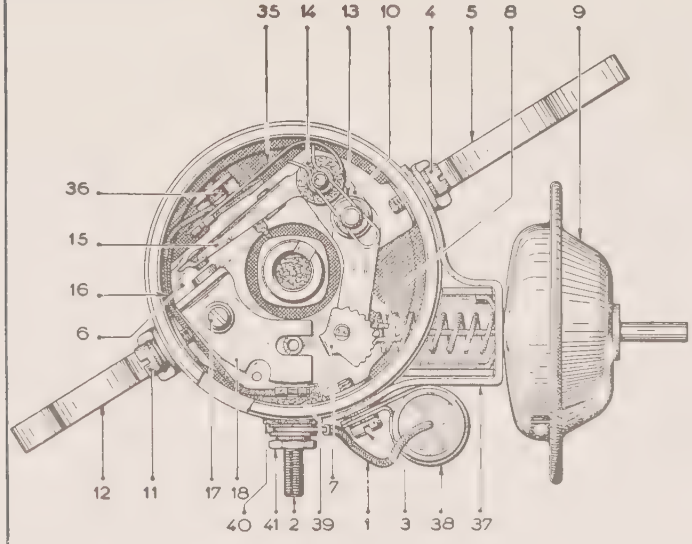
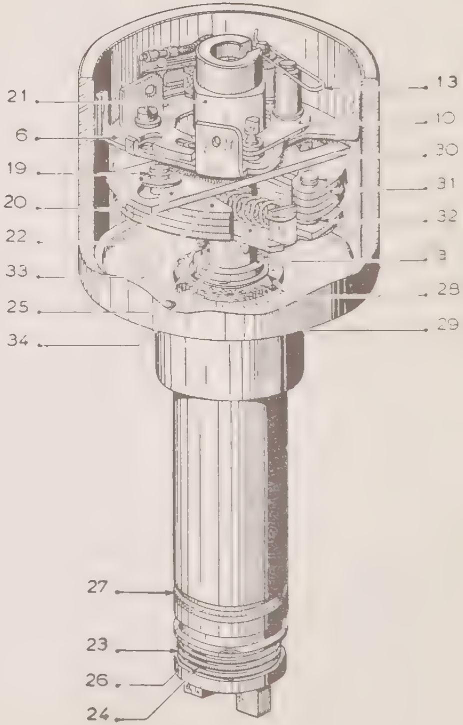


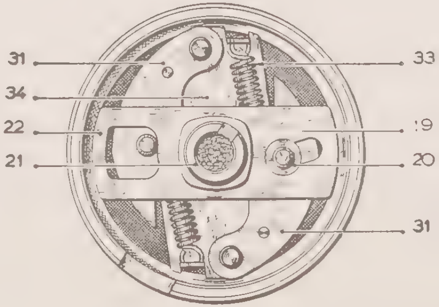
Fig 4



DUCELLIER DISTRIBUTOR







DISTRIBUTOR

ADVANCE CURVES

Fig. 2. SUCTION ADVANCE CURVE

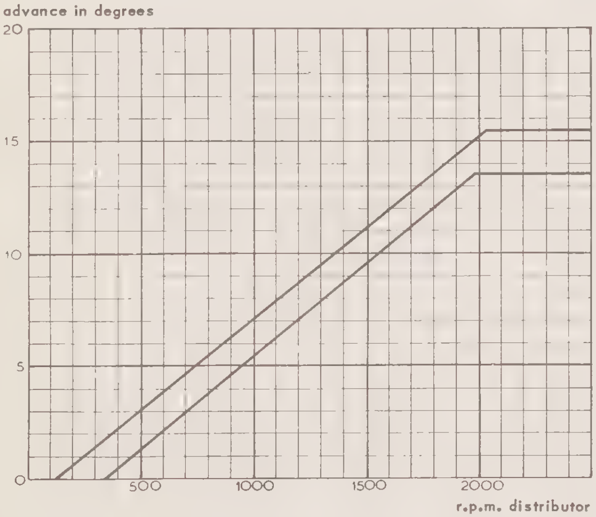
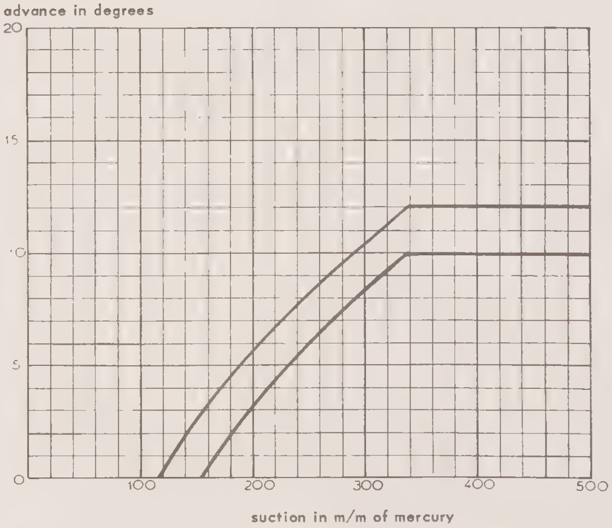
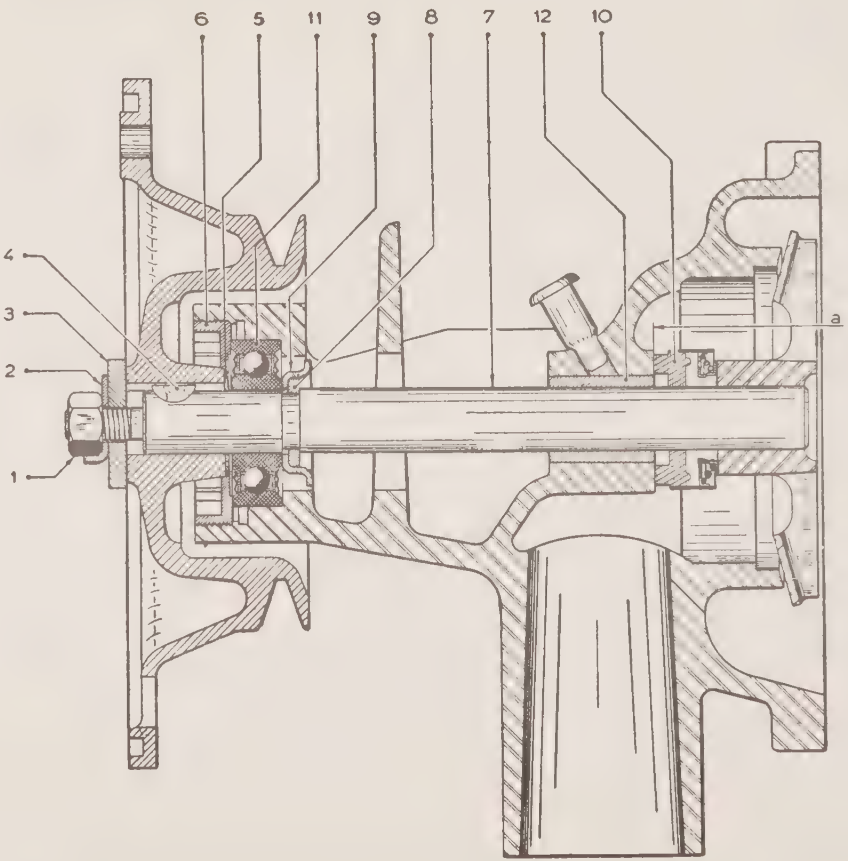


Fig. 1. CENTRIFUGAL ADVANCE CURVE



WATER PUMP



WATER PUMP

Fig. 1 _ SUPPORT MR–3676–180

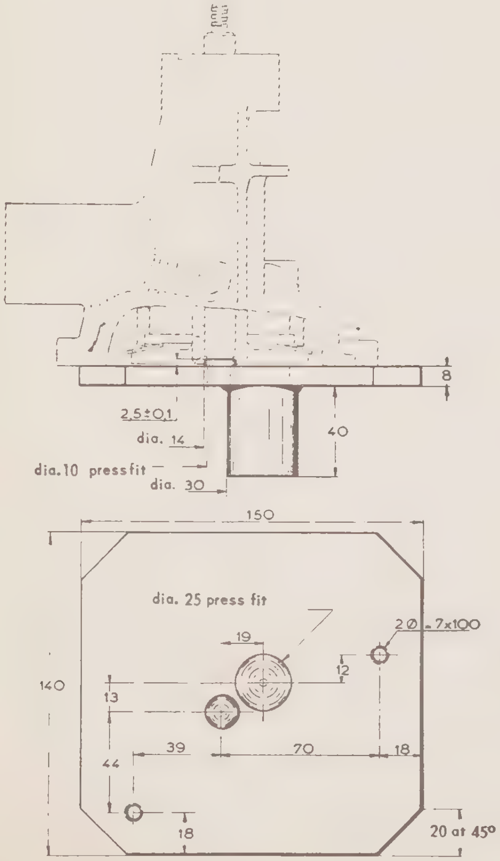


Fig. 2 – BOX SPANNER

sold under No.1646–T

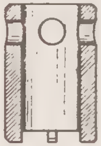


Fig. 3 – BUSH AND MANDREL MR–3676–270

not sold

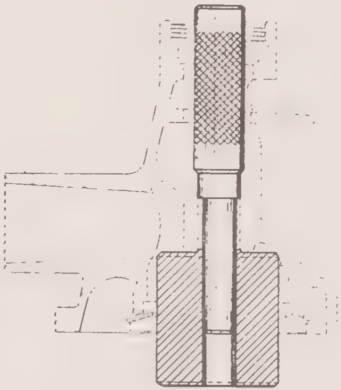
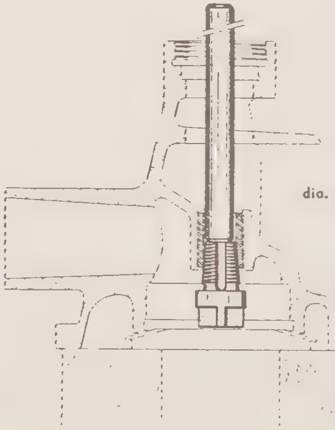
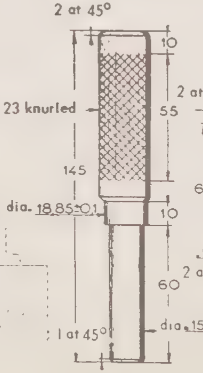


Fig. 4 – EXTRACTOR TAP

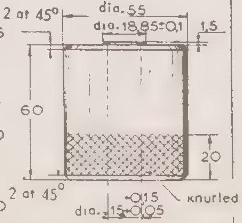
sold under No.2291–T



Mandrel – mild steel



Bush: mild steel



ASSEMBLY

Fig 1

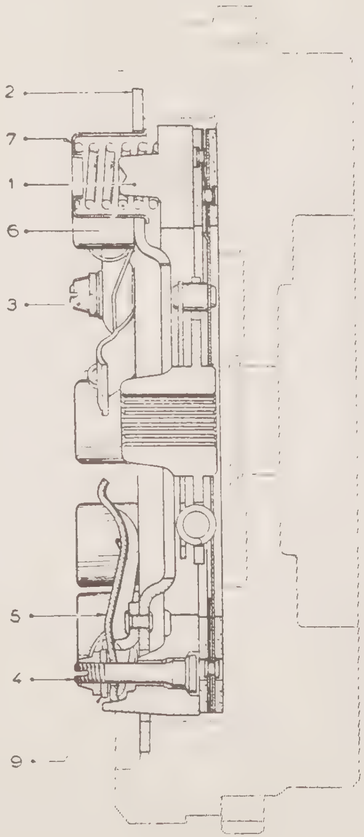


Fig. 2

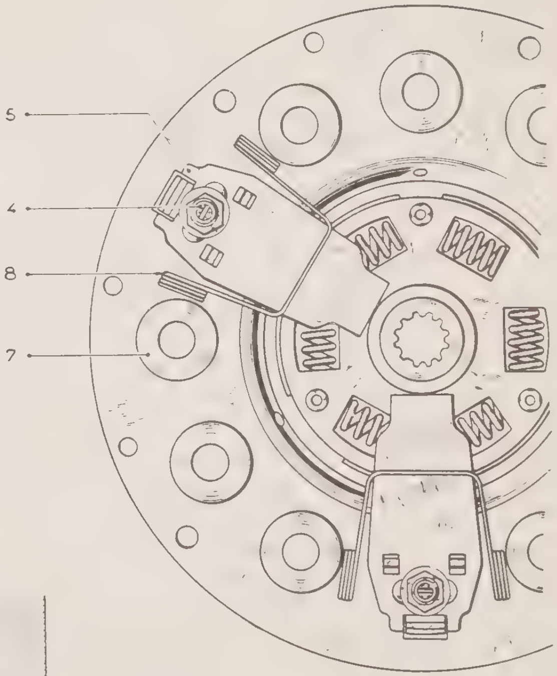


Fig 3

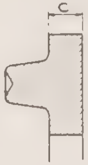
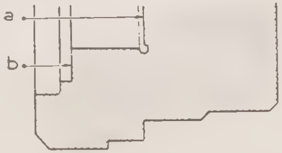


Fig 4



GRIND THE SAME AMOUNT OFF EACH OF THE TWO FACES

ADJUSTMENT OF THE TOGGLES

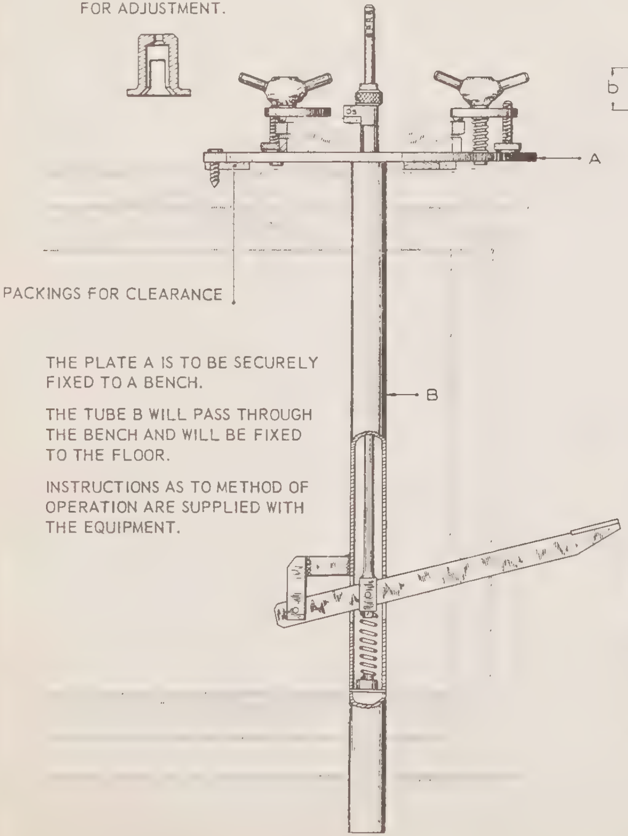
Fig. 1 _ FIXTURE FOR CLUTCH ADJUSTMENT

sold under No.1701–T

THE TOGGLE PRESSURE CAP MUST BE REMOVED FOR ADJUSTMENT.

FINGER RING AND CLAMP

sold under No.1704–T



THE PLATE A IS TO BE SECURELY FIXED TO A BENCH.

THE TUBE B WILL PASS THROUGH THE BENCH AND WILL BE FIXED TO THE FLOOR.

INSTRUCTIONS AS TO METHOD OF OPERATION ARE SUPPLIED WITH THE EQUIPMENT.

Fig. 2 _ CLUTCH MECHANISM IN THE ENGAGED POSITION

THESE DIMENSIONS CAN ONLY BE MEASURED ON A FIXTURE

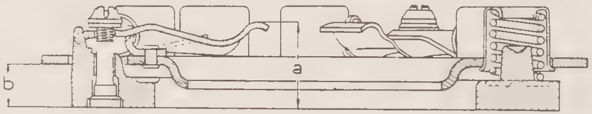
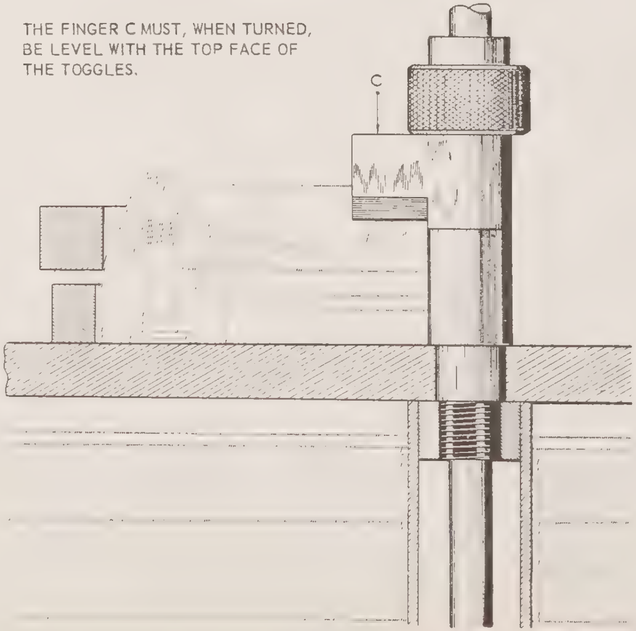


Fig 3 _ CHECKING THE ADJUSTMENT

THE FINGER C MUST, WHEN TURNED, BE LEVEL WITH THE TOP FACE OF THE TOGGLES.



ADJUSTMENT OF THE TOGGLES

Fig 1 _ ADJUSTMENT

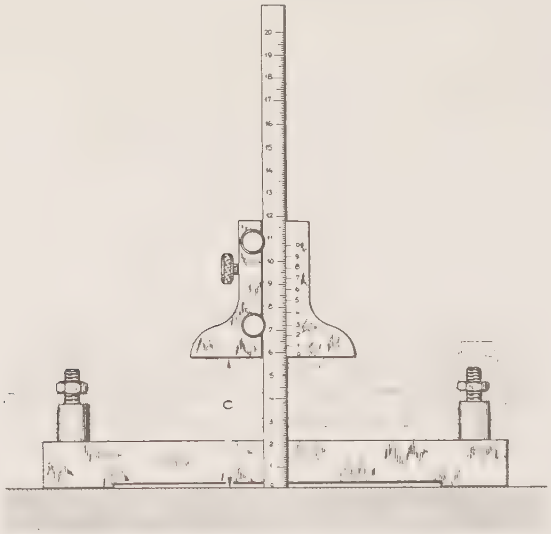


Fig. 2 _ ASSEMBLY OF THE BLOCKS

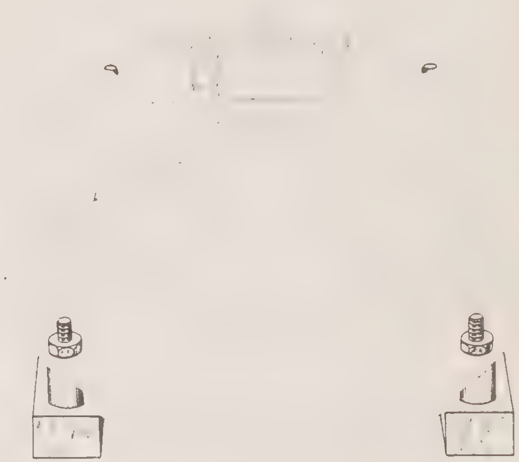


Fig 3 _ BLOCK MR-3457-100

not sold

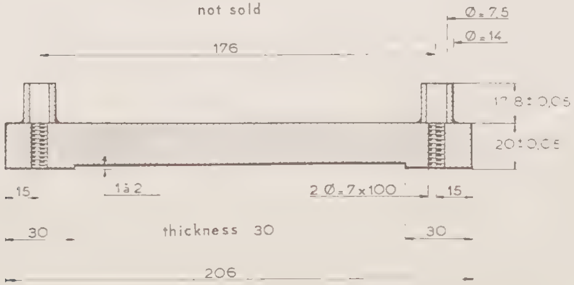
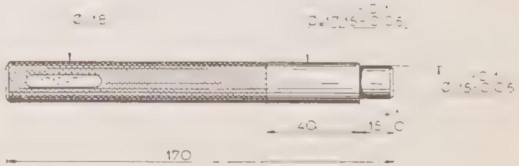
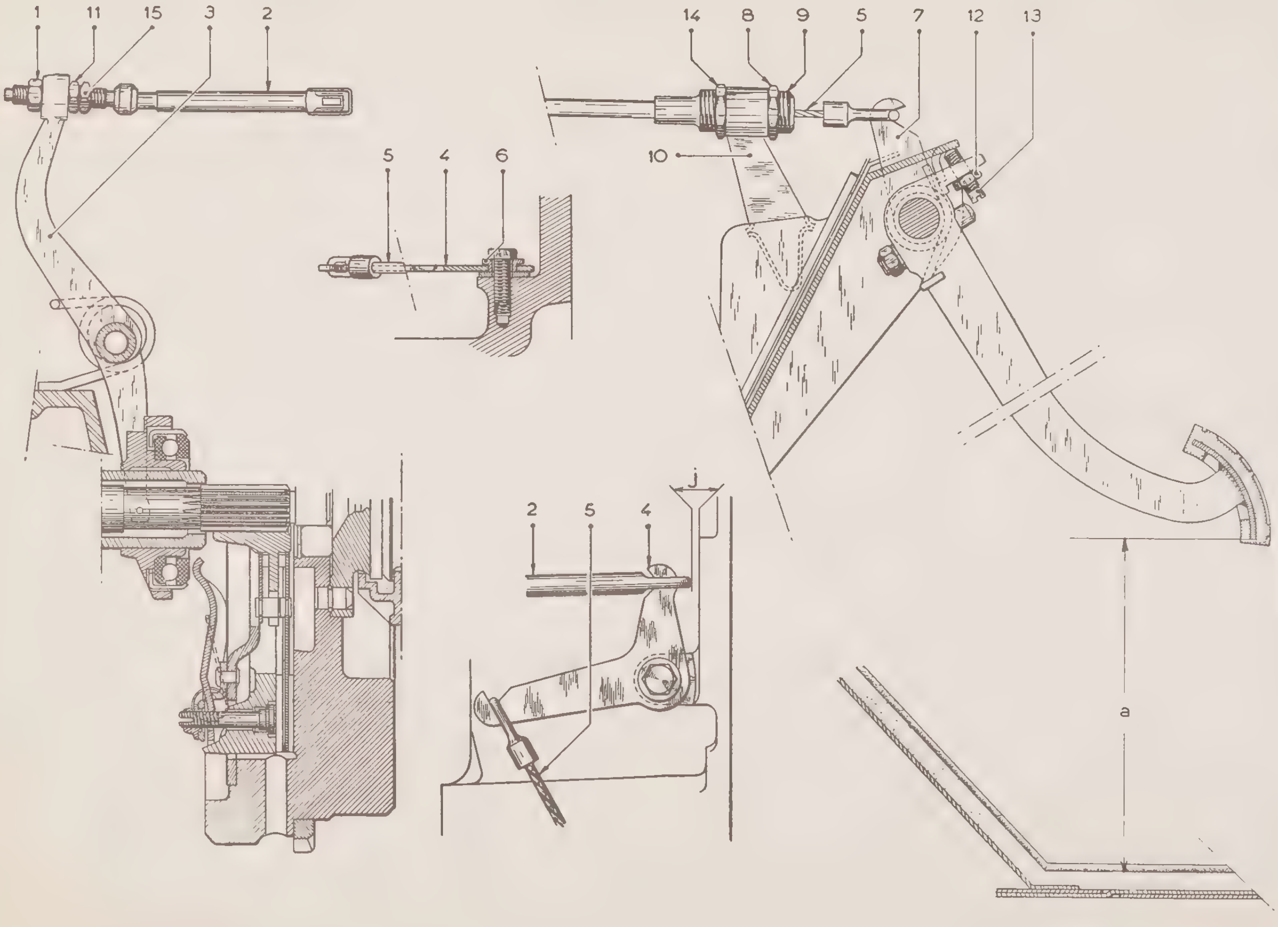


Fig. 4 _ MANDREL

sold under No.1712-T



CLUTCH CONTROL



REMOVAL AND REPLACEMENT

SUPPORT FIXTURE

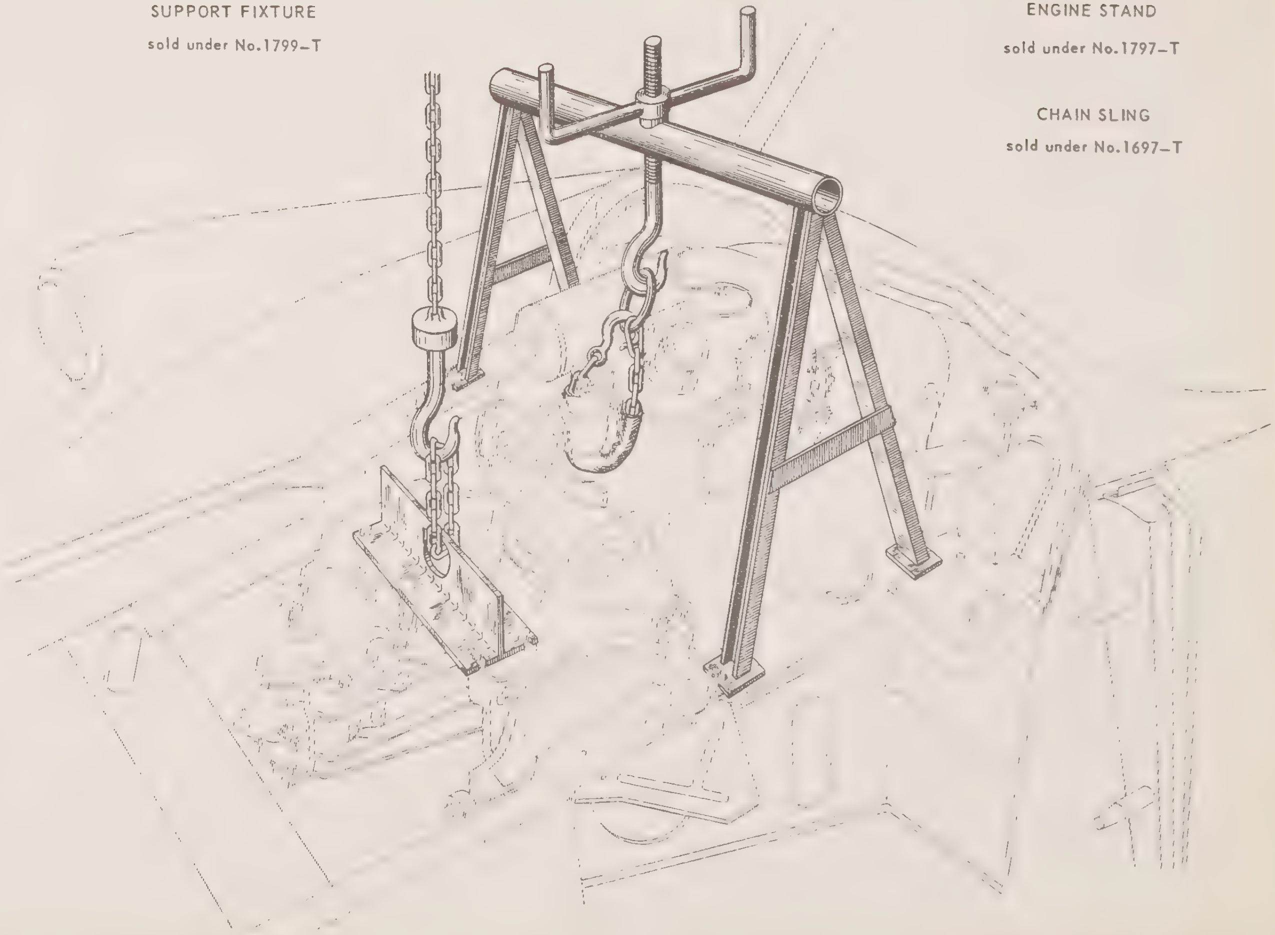
sold under No.1799–T

ENGINE STAND

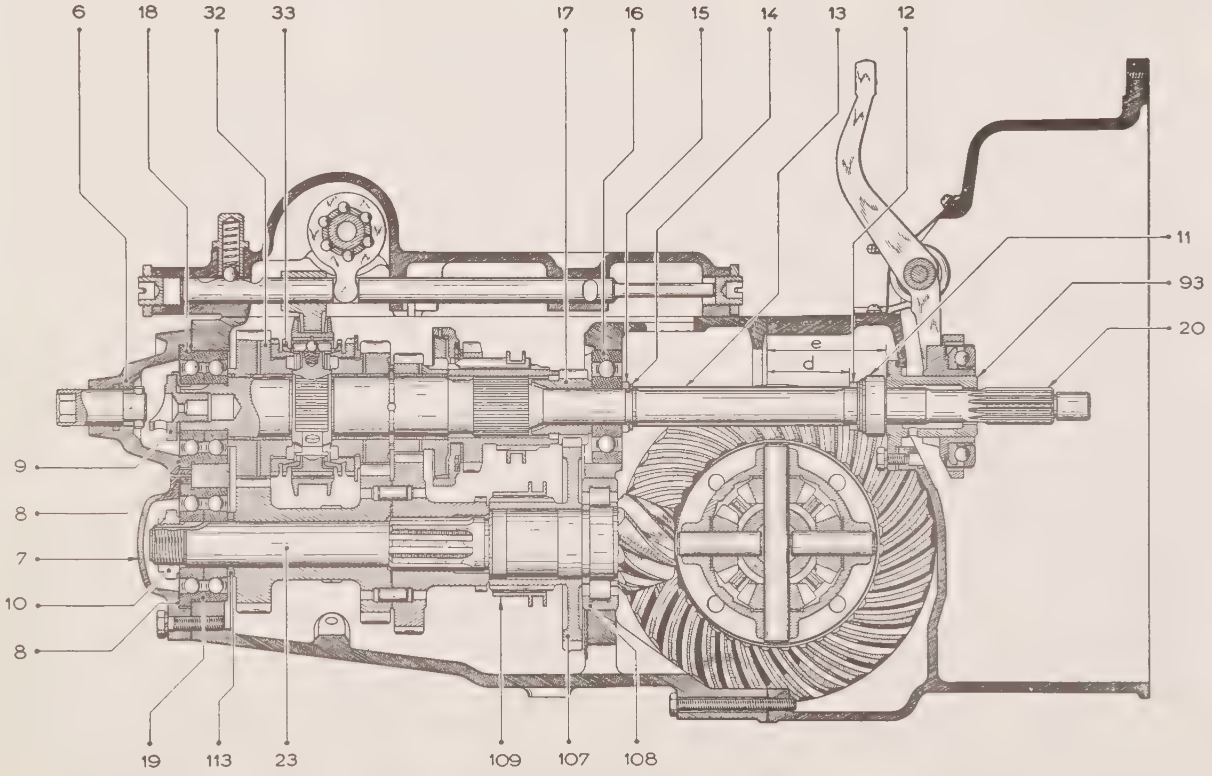
sold under No.1797–T

CHAIN SLING

sold under No.1697–T



ASSEMBLY



SHAFTS

Fig.1 — MAIN SHAFT

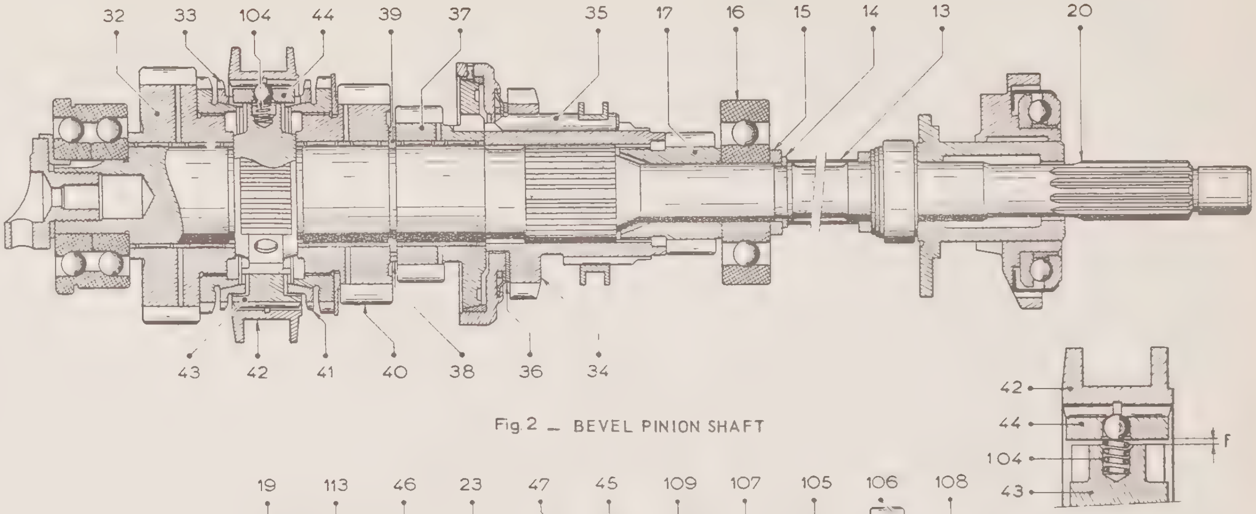
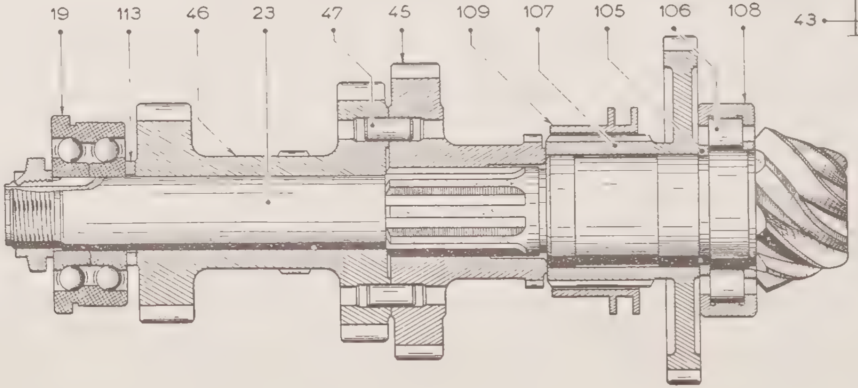


Fig.2 — BEVEL PINION SHAFT



ASSEMBLY OF PINIONS

Fig 1

teeth entry at 15°

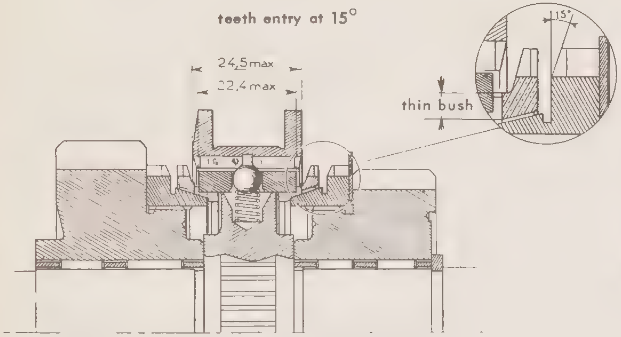


Fig 2

teeth entry straight

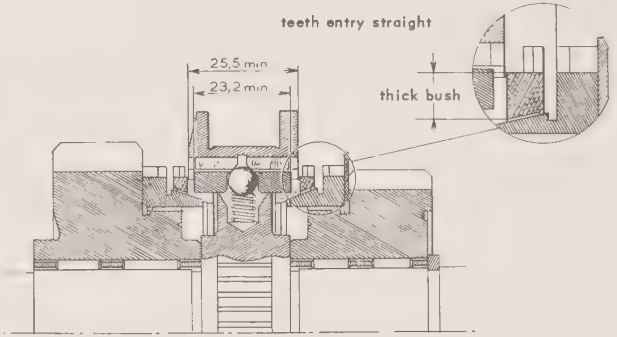
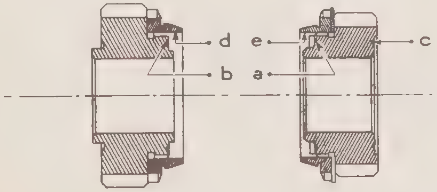


Fig 3

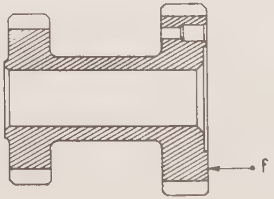


4th speed mainshaft pinion

3rd speed mainshaft pinion

Fig. 4

Intermediate train



OPERATIONS
ID 133-1
ID 330-3
ID 330-4

DIFFERENTIAL

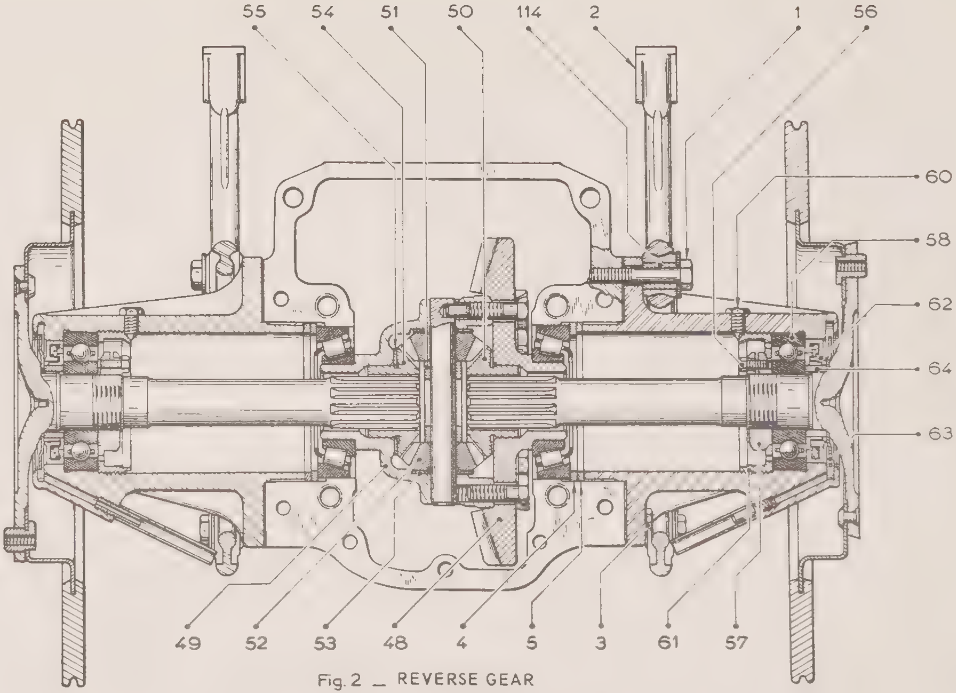
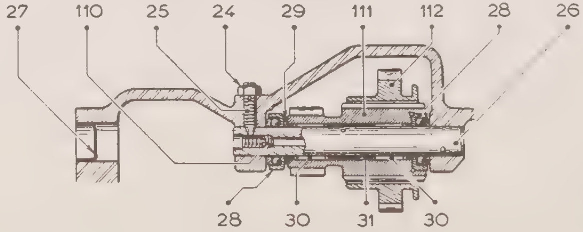


Fig. 2 _ REVERSE GEAR



REVERSE SPEED PINION

Fig.1 MAINSHAFT ASSEMBLY

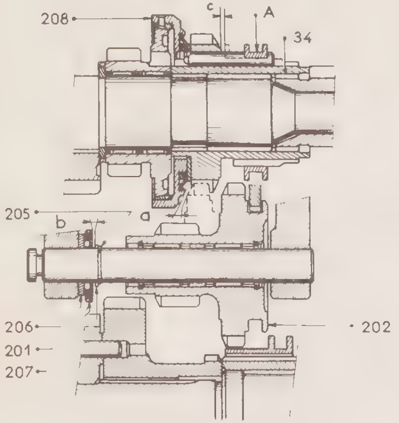


Fig.2 SETTING THE DIAL GAUGE

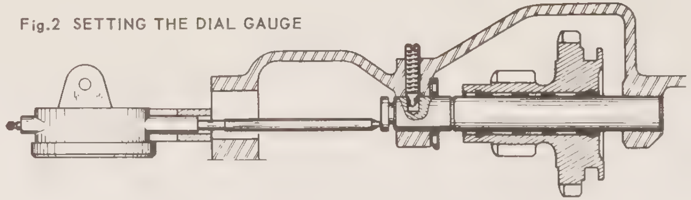


Fig.3 ADJUSTMENT OF THE REVERSE SPEED SLIDING PINION

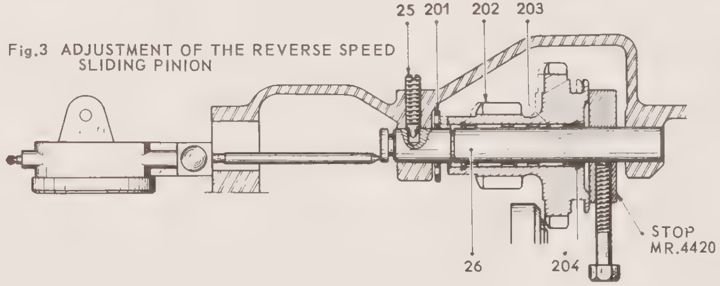
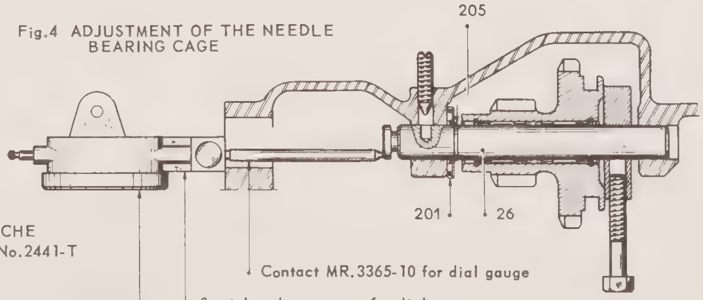


Fig.4 ADJUSTMENT OF THE NEEDLE BEARING CAGE

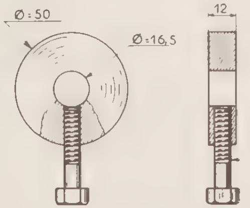


Contact MR.3365-10 for dial gauge

Straight edge support for dial gauge

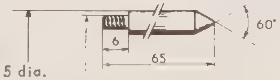
Dial gauge sold under No.2437-T

Fig.6 STOP MR.4420
not sold



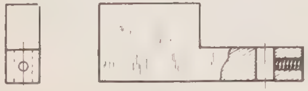
Screw 7 dia. 100 pitch
length 50

Fig.5 TOUCHE
sold under No.2441-T



5 dia.
3 dia. 60 pitch

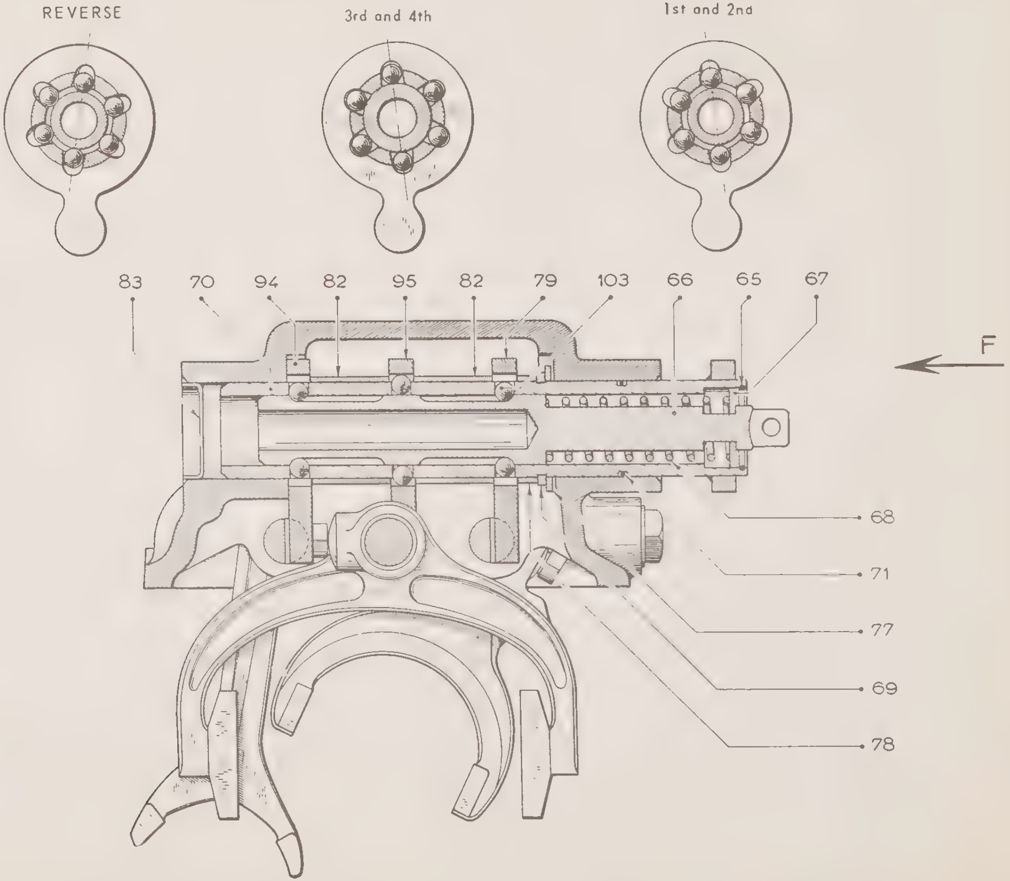
Fig.7 STRAIGHT EDGE SUPPORT
sold under No.1754-T



COVER

LEVERS OPERATING THE SELECTOR SHAFTS

view in direction of arrow F



COVER

Fig 1

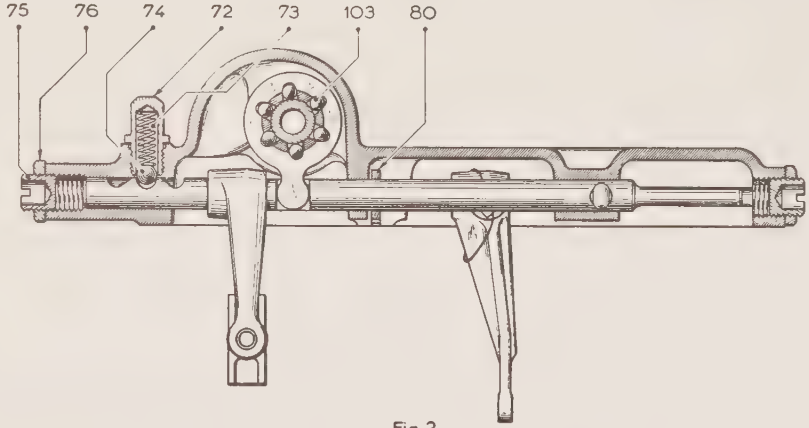
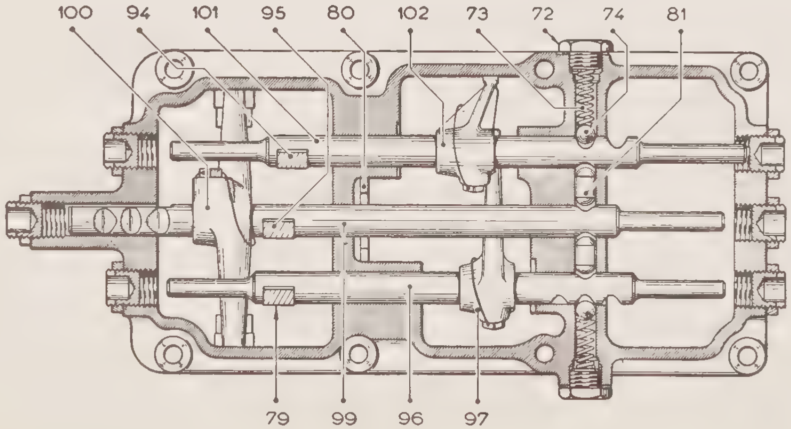


Fig. 2



FIRST SPEED SELECTOR LEVER

Fig. 1

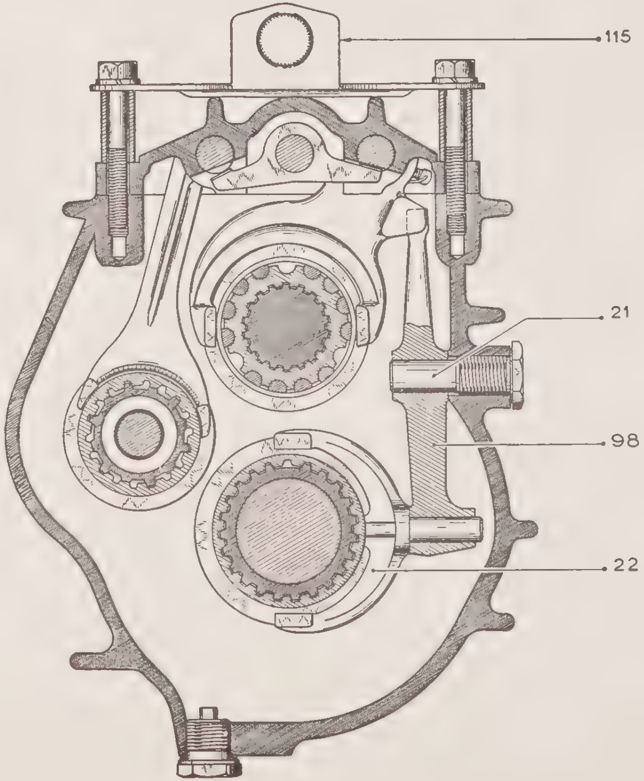
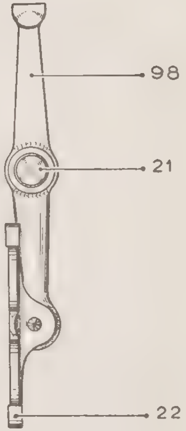


Fig. 2



OPERATIONS
ID 231-4
ID 314-4
ID 330-2
ID 330-3

CLUTCH HOUSING

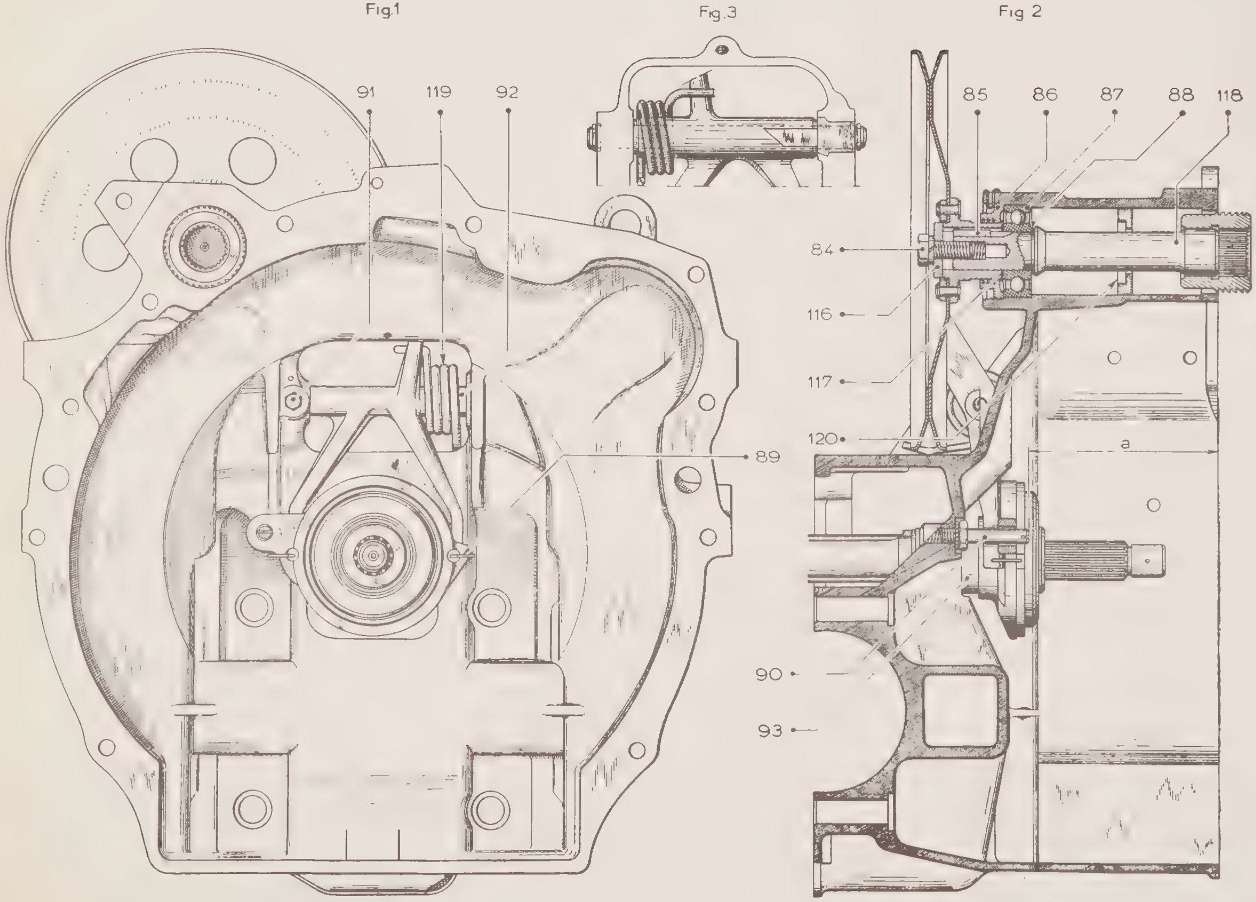


Fig.1

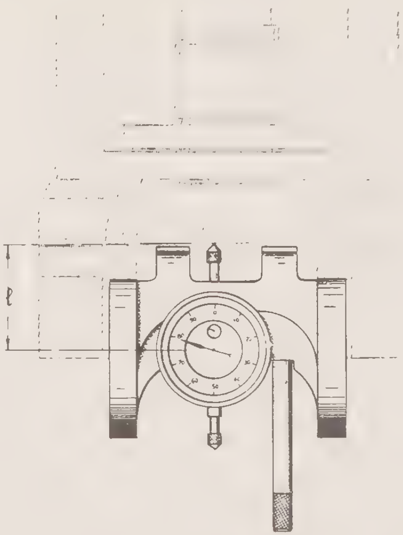
Fig.3

Fig 2

ADJUSTMENT OF CROWN WHEEL AND BEVEL PINION

Fig.1 – ADJUSTMENT OF BEVEL PINION SETTING

DIAL GAUGE
sold under No.2437–T



ADJUSTING FIXTURE
sold under No.2044–T

Fig. 2 – ADJUSTMENT OF TOOTH CLEARANCE

SUPPORT FOR DIAL GAUGE
sold under No.2039–T

EXTENSION
sold under No.2439–T

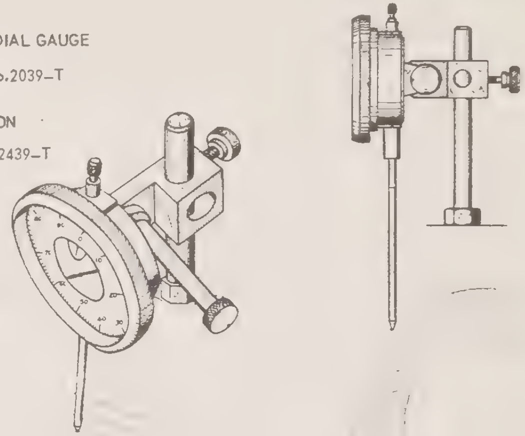
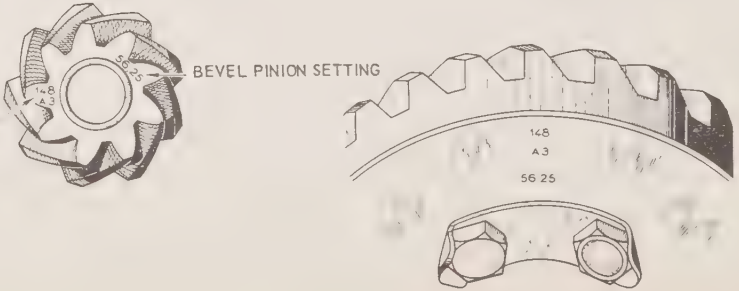
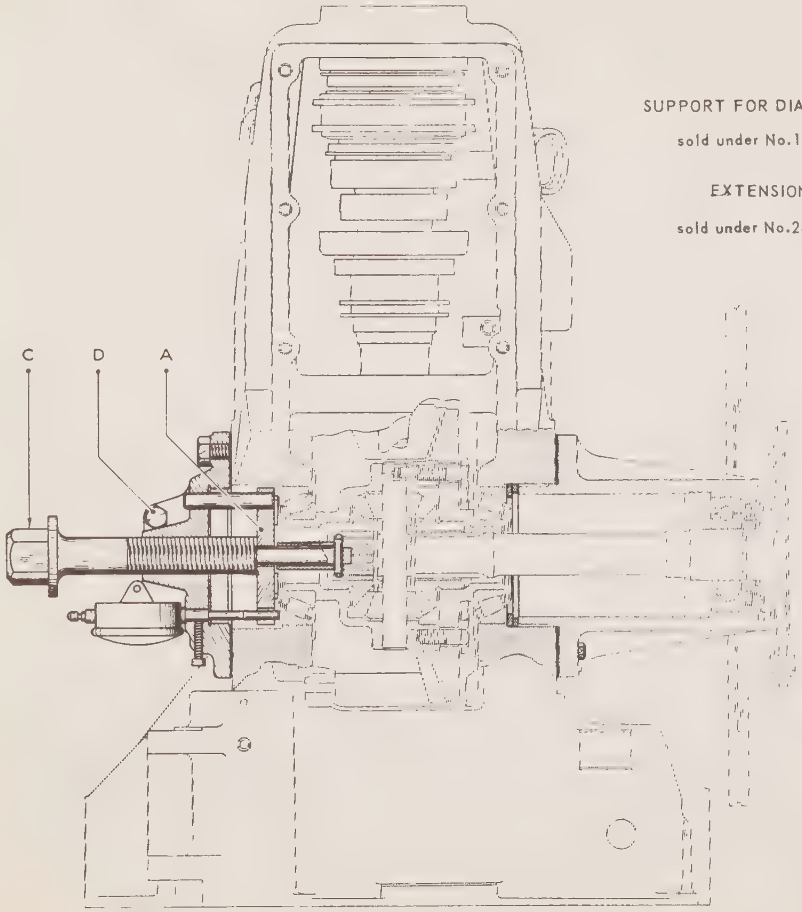


Fig. 3 – MARKING



ADJUSTMENT OF THE DIFFERENTIAL BEARINGS

Fig.1 _ MEASURING THE DEPTH OF THE HOUSING



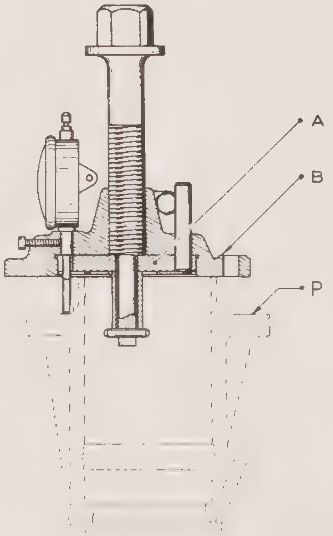
SUPPORT FOR DIAL GAUGE

sold under No.1766–T

EXTENSION

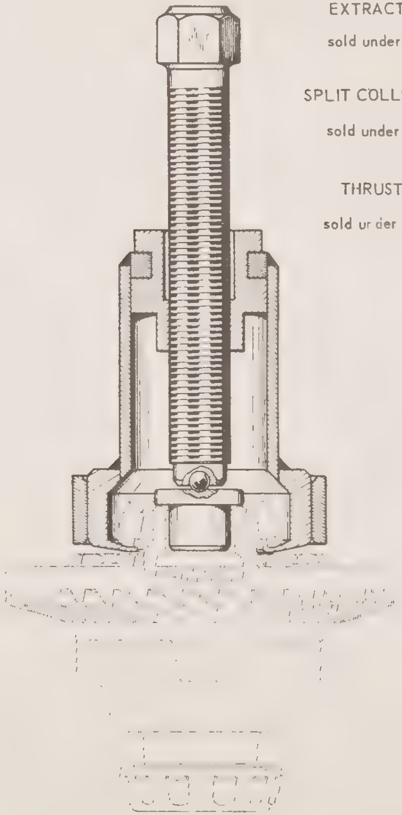
sold under No.2438–T

Fig.2 _ MEASURING THE HEIGHT OF THE SHOULDER OF THE HUB



DIFFERENTIAL BEARING

Fig.1 _ EXTRACTION OF BEARING

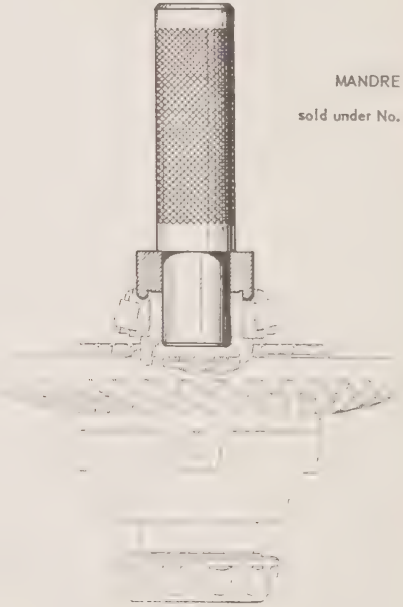


EXTRACTOR BODY
sold under No.1750–T

SPLIT COLLET AND RING
sold under No.1753–T

THRUST BLOCK
sold under No.1742–T

Fig.2 _ FITTING BEARING ROULEMENT

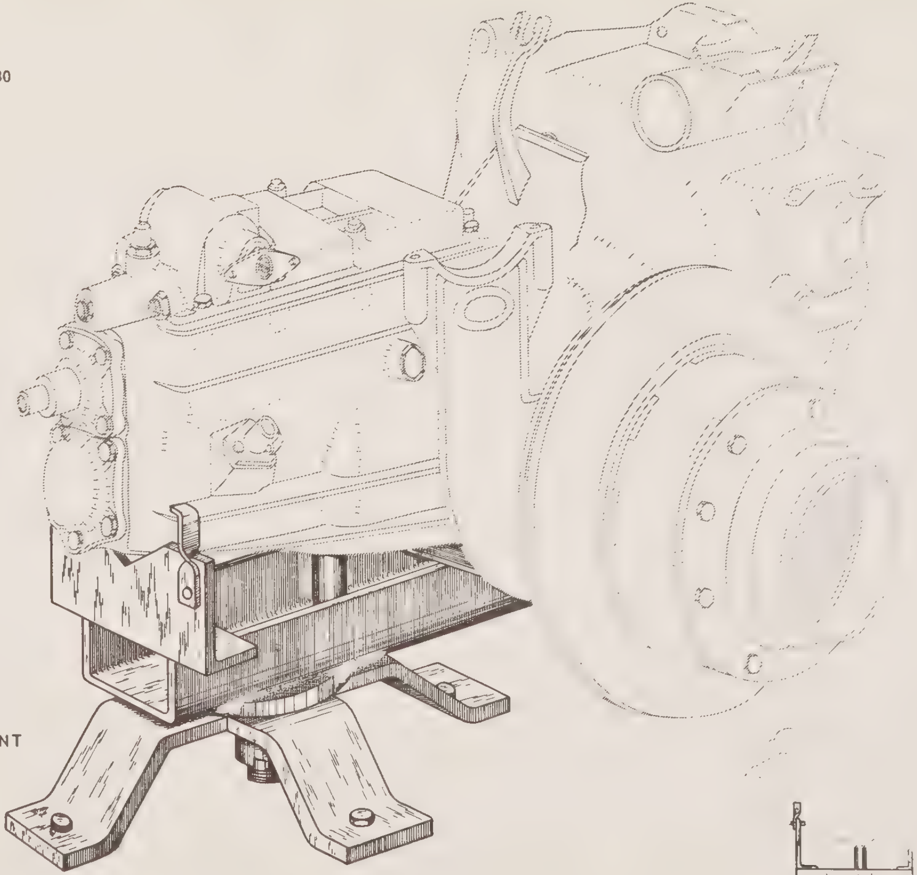


MANDREL
sold under No.1768–T

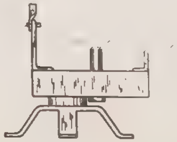
STAND FOR GEARBOX FOR USE ON BENCH

STAND MR–3053–130

not sold



FOR CONSTRUCTIONAL
DIMENSIONS APPLY TO
THE SERVICE DEPARTMENT



VARIOUS TOOLS

Fig.1 _ MANDREL MR-3045

not sold

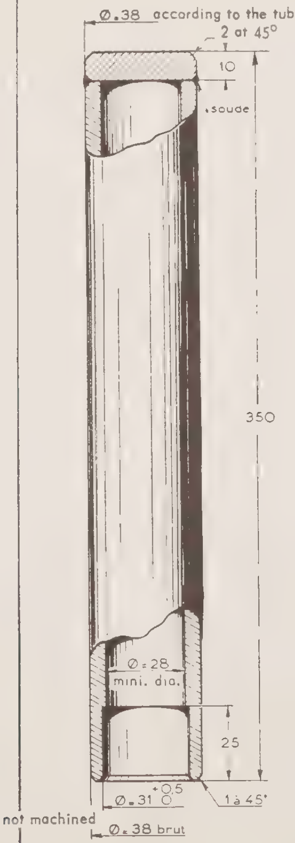


Fig. 2 _ MANDREL MR-3676-30

not sold

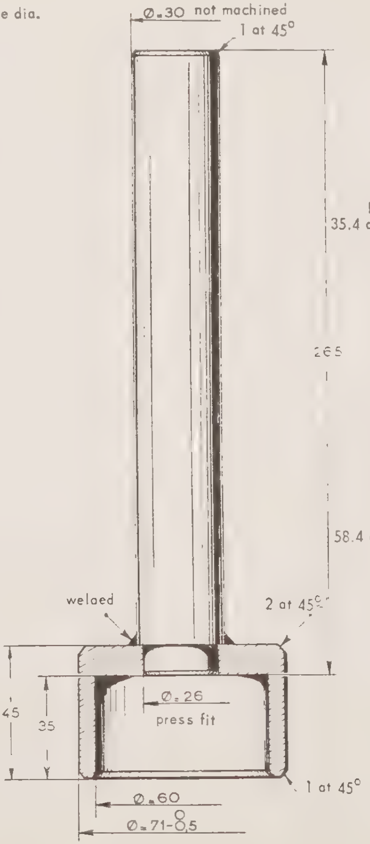


Fig.3 _ SPANNER

sold under No.1734-T

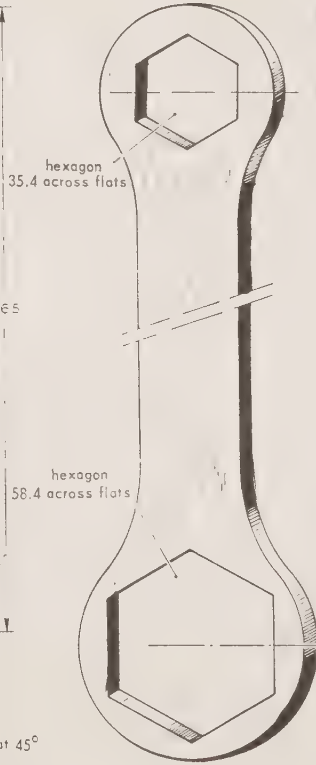
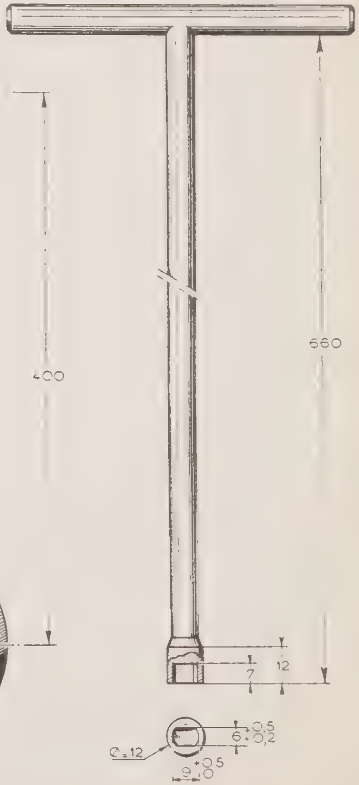


Fig.4 _ SPANNER

sold under No.1677-T



VARIOUS TOOLS

Fig. 1 — MANDREL

sold under No. 1767-T

THE BUSH A CENTRES THE OIL RETAINING WASHER AND THE MANDREL B. ASSURES THE POSITIONING OF THE THRUST BEARING.

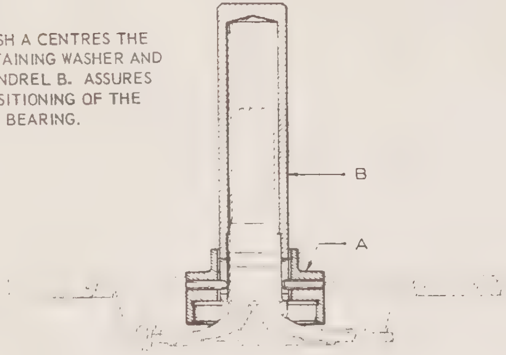
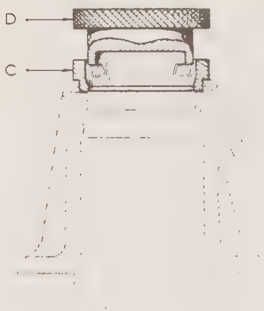


Fig 2 — MANDREL

sold under No. 1772-T



THE BUSH C CENTRES THE SEALING JOINT AND THE MANDREL D ASSURES THE POSITIONING OF THE JOINT.

Fig. 3 — SPANNER

sold under No. 1771-T

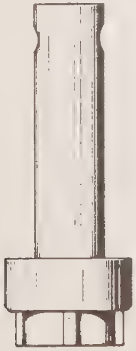


Fig. 4 — SPANNER

sold under No. 1770-T

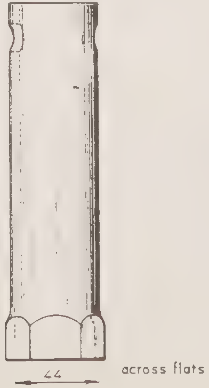
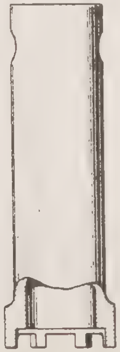


Fig. 5 — SPANNER

sold under No. 1640-T



ASSEMBLY OF THE LEVERS OPERATING THE SELECTOR SHAFTS

Fig. 1

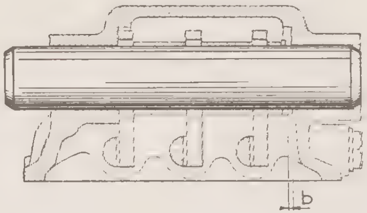


Fig. 3

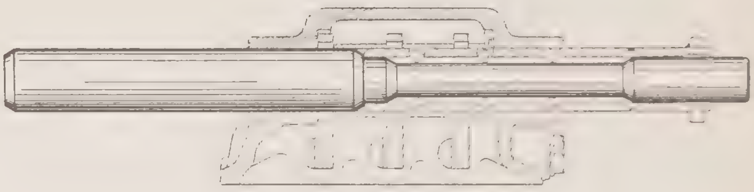


Fig. 2

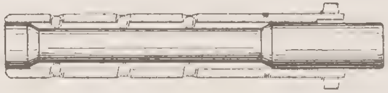


Fig. 4

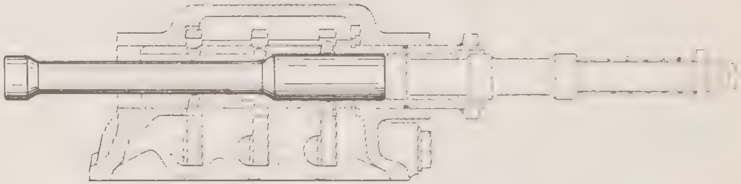
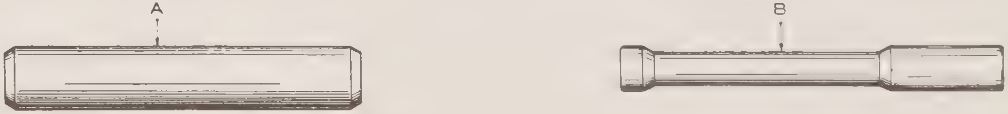


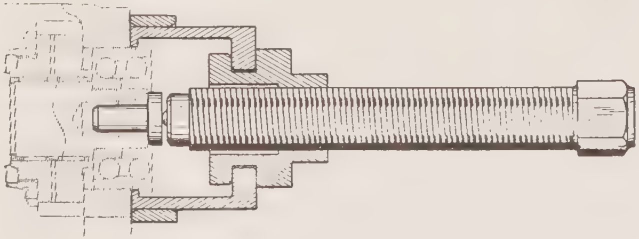
Fig.5 _ MANDREL

sold under No.1793-T



VARIOUS TOOLS

Fig.1 — EXTRACTOR FOR MAIN SHAFT FRONT BEARING



EXTRACTOR BODY

sold under No.1750–T

SPLIT COLLAR AND PRESSURE PAD

sold under No.1738–T

Fig. 2 — SPANNER MR–3691–80

not sold

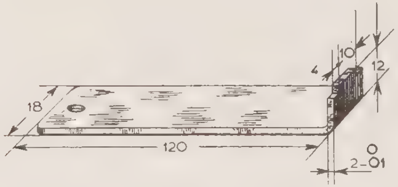


Fig. 5 SPANNER Sold under No. 1705–T

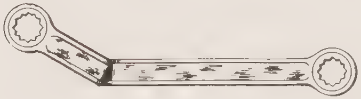


Fig. 3 — EXTRACTOR FOR BEVEL PINION SHAFT FRONT BEARING

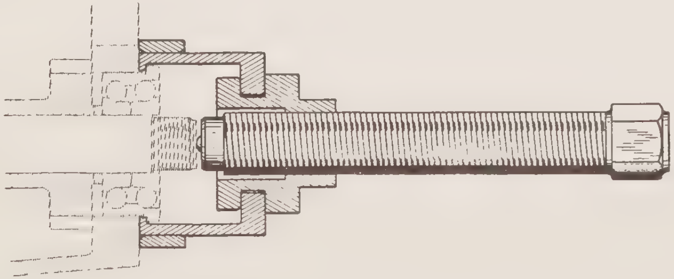
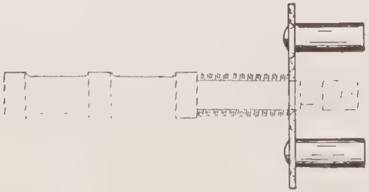


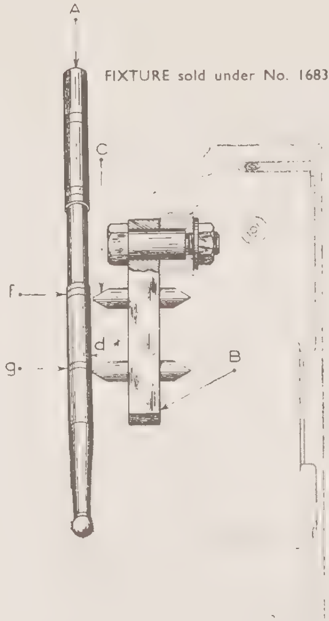
Fig. 4 — SPRING COMPRESSOR

sold under No.1792–T



ALIGNMENT OF THE PULLEYS

Fig 1


FIXTURE sold under No. 1683-T

Checking the position of the Driving Pulley

Fig 2

Checking the position of the Water Pump Pulley

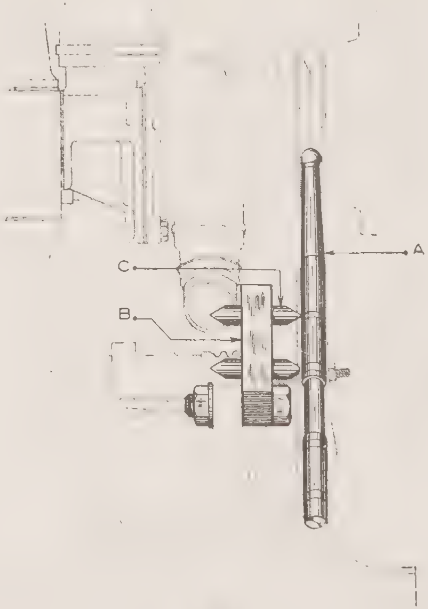
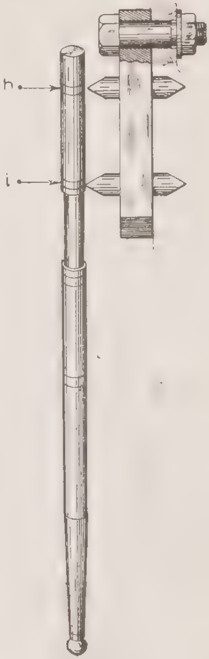


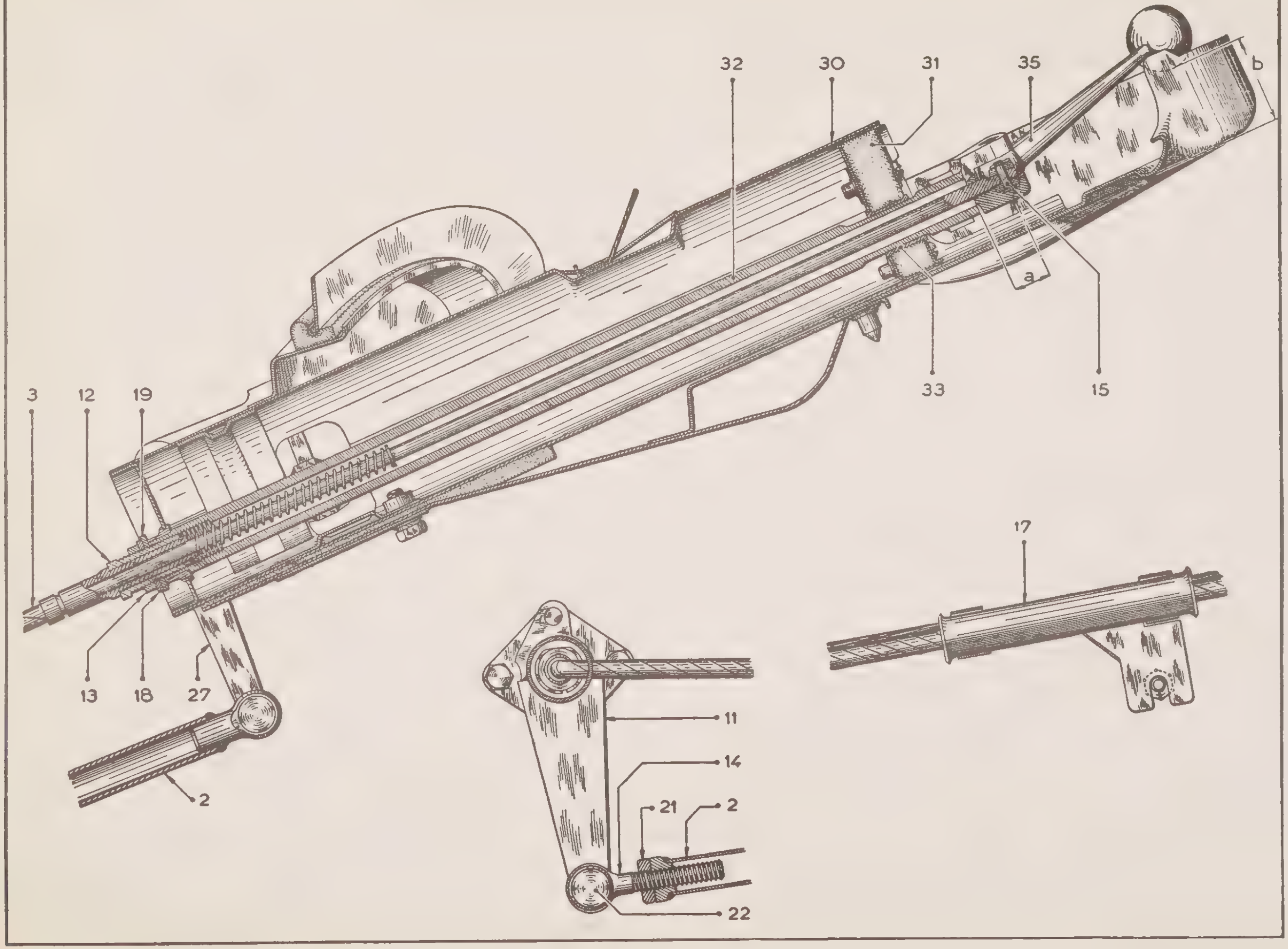
Fig 3



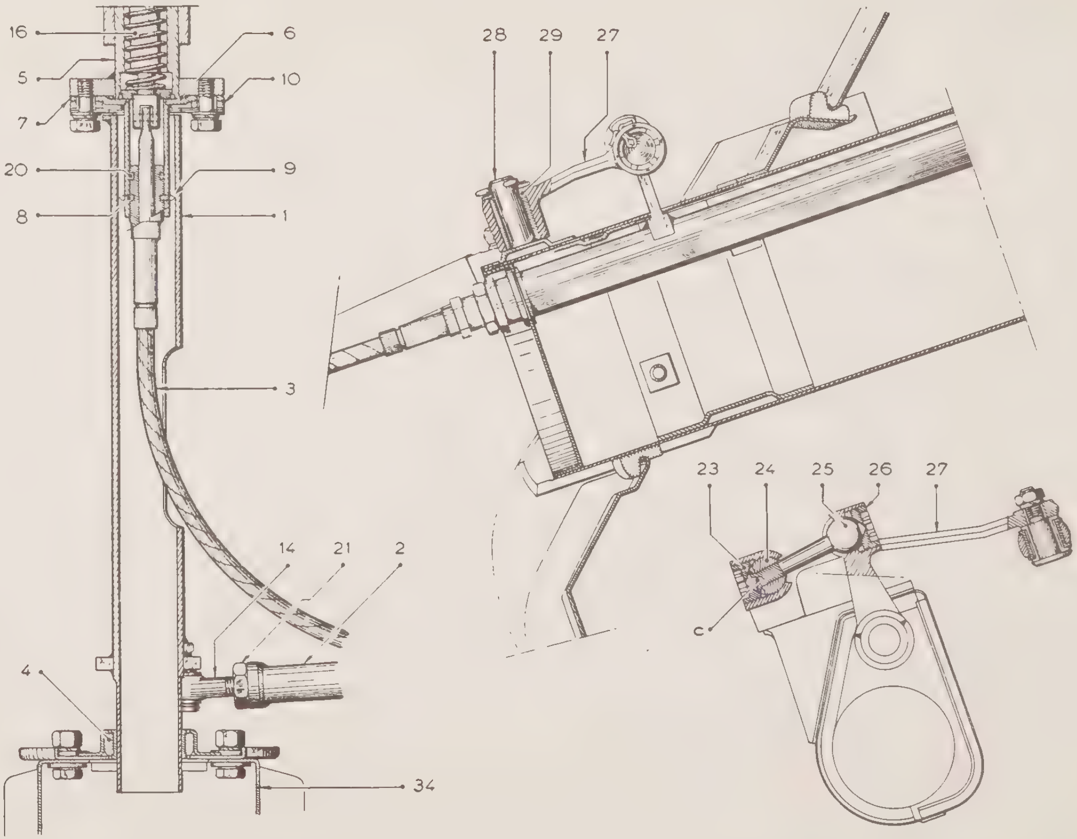
Checking the position of the Dynamo Pulley

Fig. 4

GEAR CHANGE CONTROL



GEAR CHANGE CONTROL



VARIOUS TOOLS

Fig. 1 — SPANNER

sold under No.2431—T

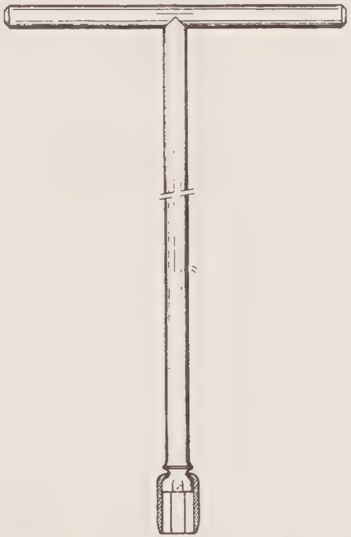


Fig. 2 — CLAMP

sold under No.2427—T

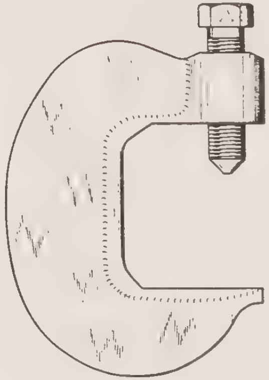


Fig. 3 — SPANNER

sold under No.2219—T

Spanner 2219-T $a = 9^{+0,2}_{0}$

Spanner 2220-T $a = 15^{+0,3}_{+0,1}$

Spanner 2221-T $a = 10^{+0,2}_{0}$

Spanner 2222-T $a = 13^{+0,3}_{+0,1}$

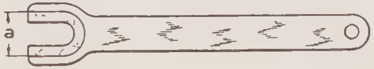
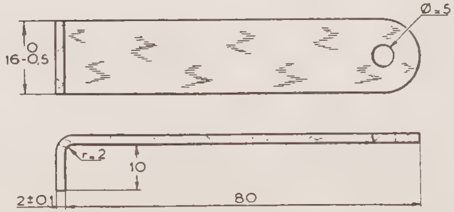


Fig. 4 — SPANNER MR—3691—60

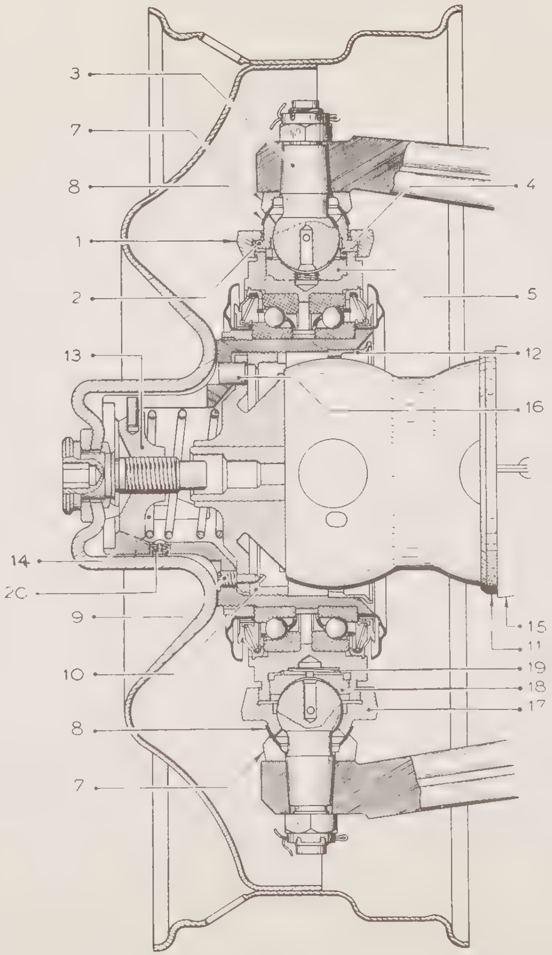
not sold

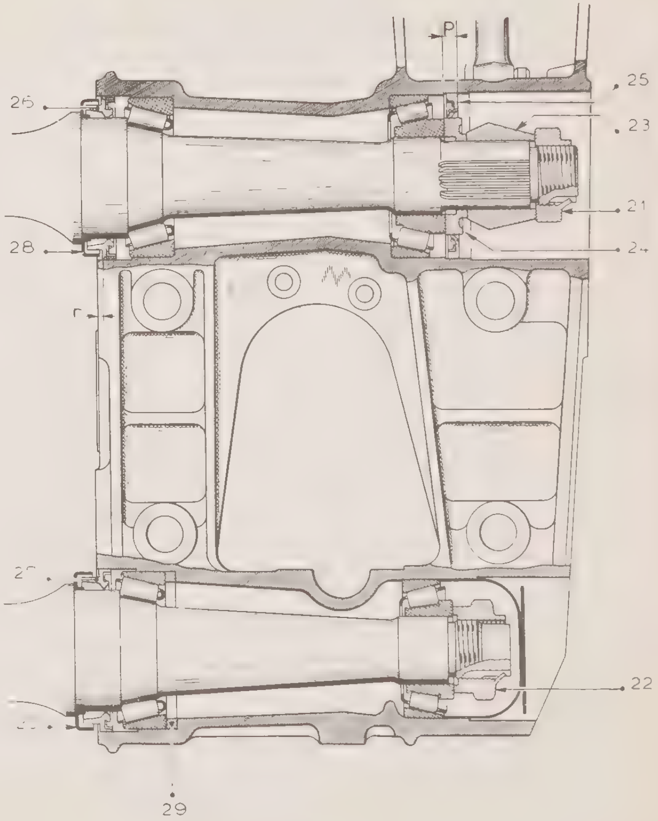


OPERATIONS
ID 372-1
ID 410-3
ID 413-1

FRONT AXLE

SECTIONS





OPERATIONS

ID 410-3

ID 413-1

SECTION OF THE UPPER BALL JOINTS

Fig 1

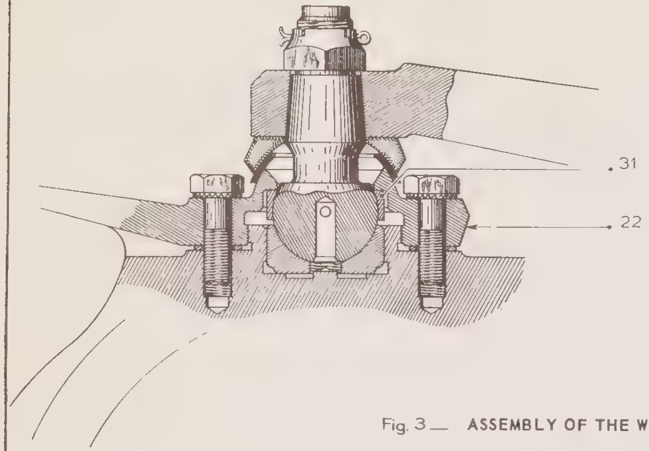


Fig 2

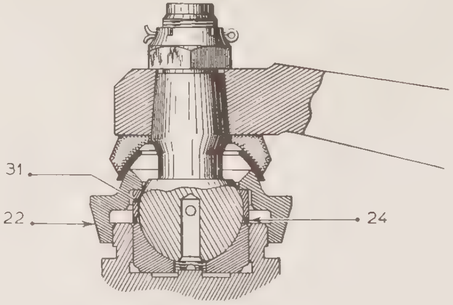
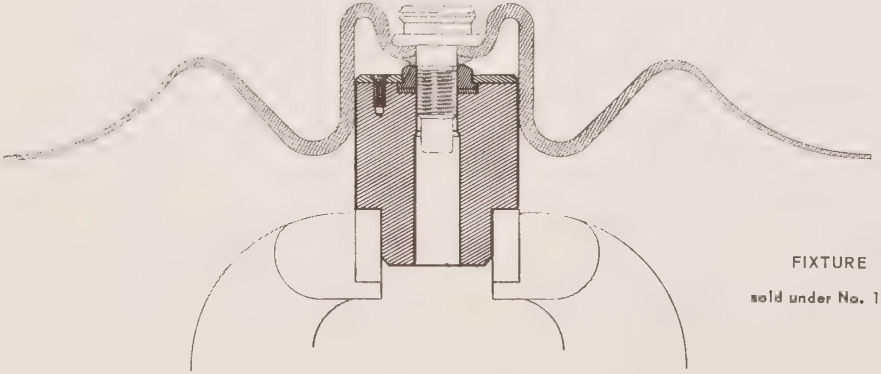


Fig. 3 — ASSEMBLY OF THE WHEEL LOCKING SCREW



FIXTURE

sold under No. 1868-T

VARIOUS TOOLS

Fig. 1 – EXTRACTOR

sold under No.1856–T

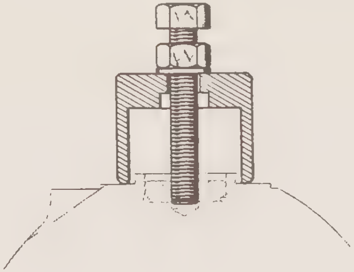


Fig. 2 – FIXTURE

sold under No.1857–T

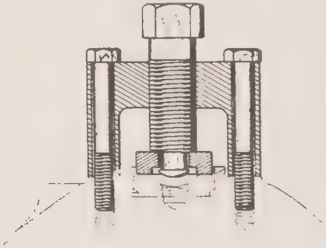
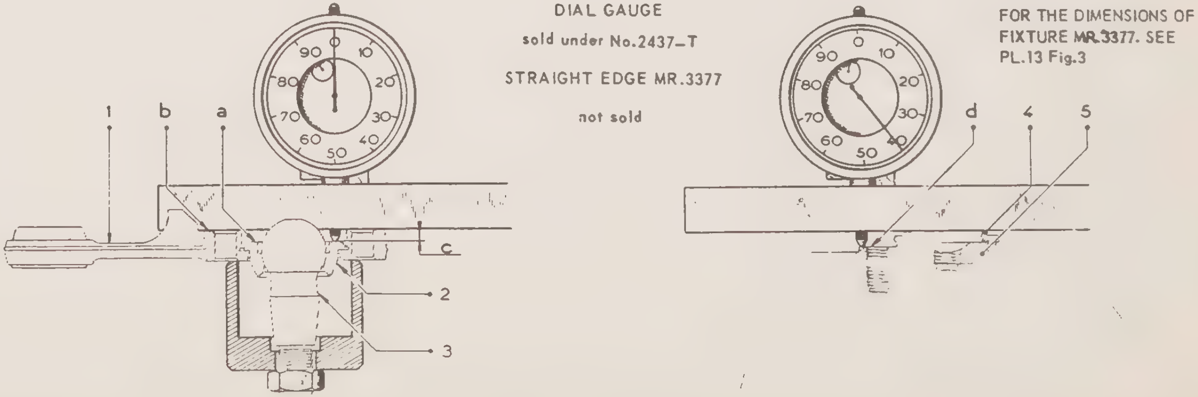


Fig. 3 – ADJUSTING THE UPPER BALL JOINT



SETTING DIAL GAUGE
USING THE BODY OF EXTRACTOR 1856–T

MEASURING THE THICKNESS OF ADJUSTING WASHER

DIAL GAUGE

sold under No.2437–T

STRAIGHT EDGE MR.3377

not sold

FOR THE DIMENSIONS OF
FIXTURE MR.3377. SEE
PL.13 Fig.3

VARIOUS TOOLS

Fig. 1 — ADJUSTING FIXTURE

sold under No.1867–T

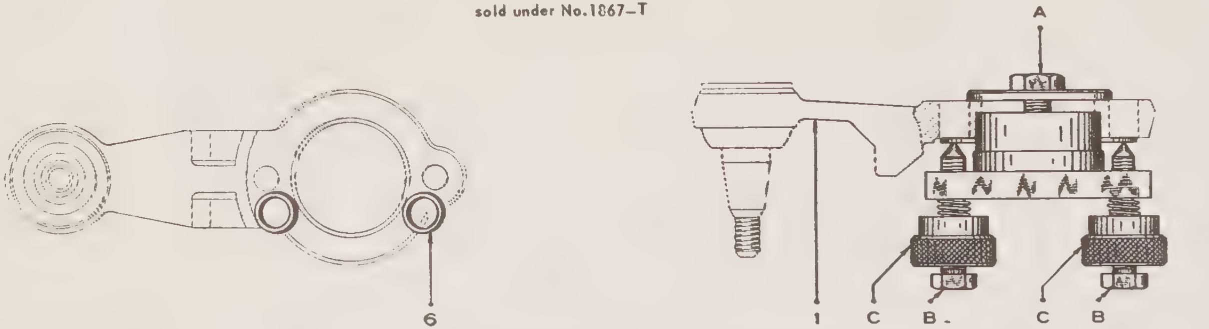


Fig. 2 — EXTRACTOR

sold under No.1964–T

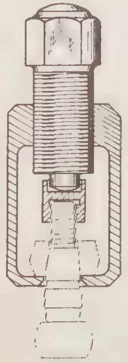


Fig. 3 —EXTRACTOR AND PRESSURE PAD

sold under No.1864–T

PRESSURE PAD

sold under No.1968–T

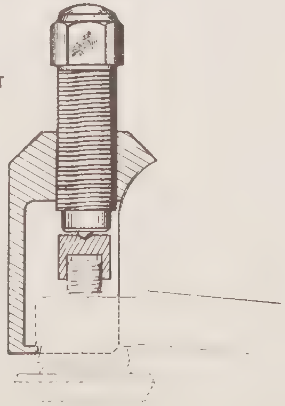


Fig 4 — SPANNER MR 3691–40

not sold

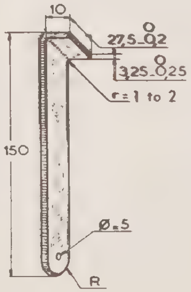
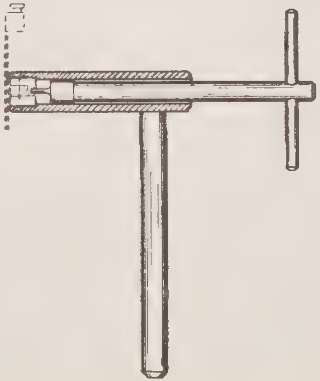


Fig. 5 — SPANNER

sold under No.2285–T



SUPPORT FOR HALF-AXLE

Fig. 1 — SUPPORT MR-3053-120

not sold

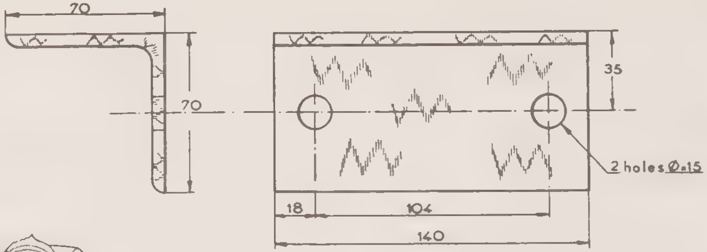
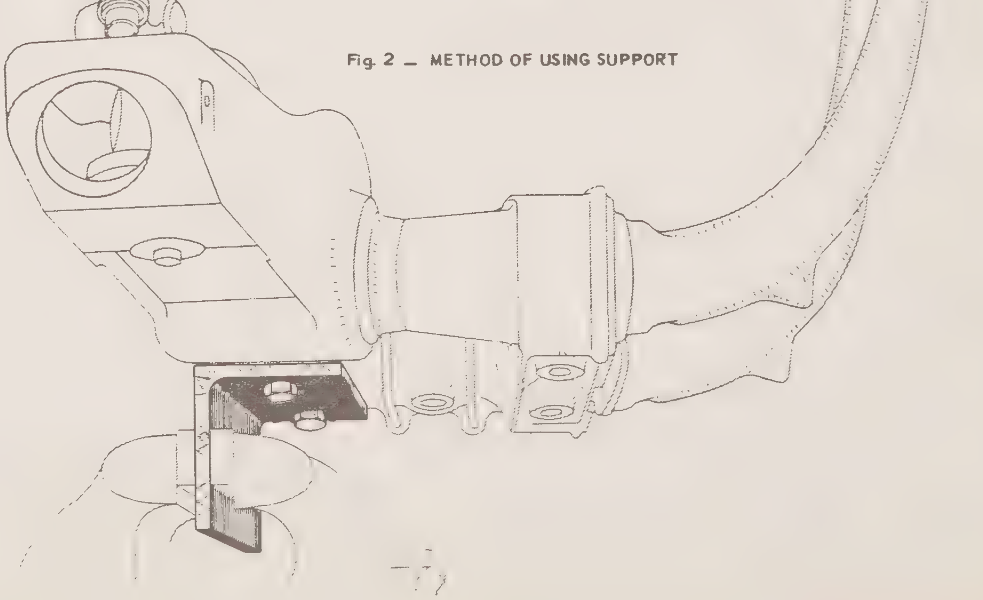


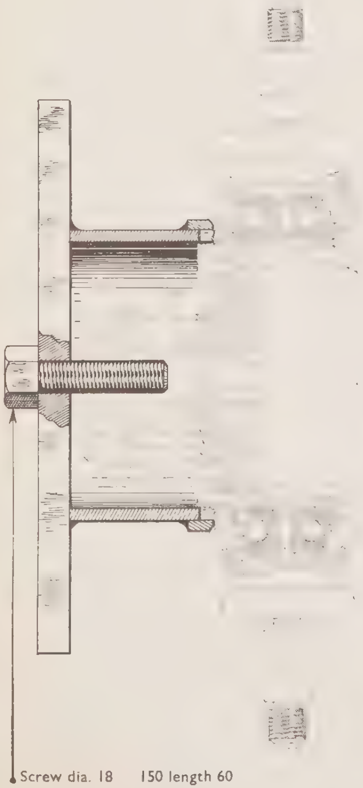
Fig. 2 — METHOD OF USING SUPPORT



VARIOUS TOOLS

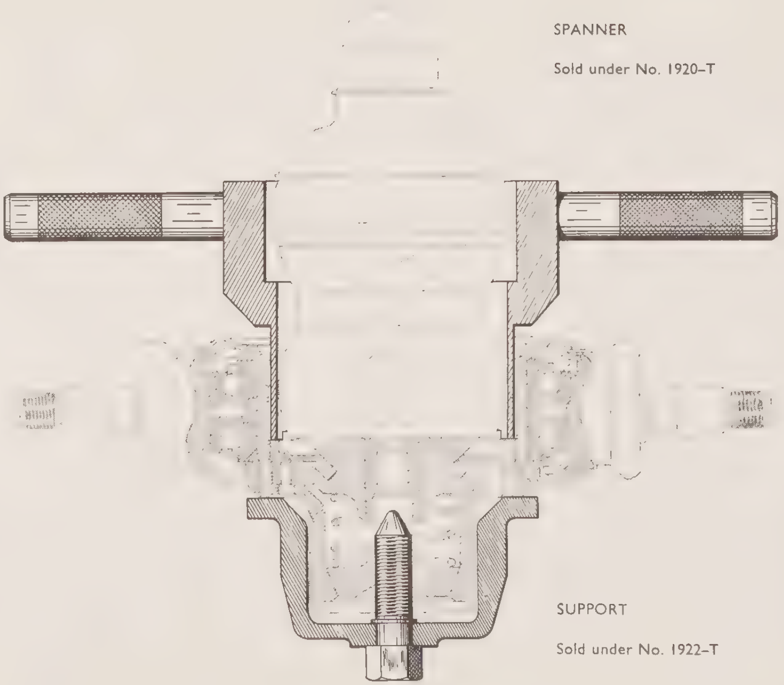
Fig. 1 SPANNER

Sold under No. 1921–T



Screw dia. 18   150 length 60

Fig 2



SPANNER

Sold under No. 1920–T

SUPPORT

Sold under No. 1922–T

ASSEMBLY OF THE SEALS

Fig. 1 — METHOD OF USING THE RING AND DISC MR-3676-140

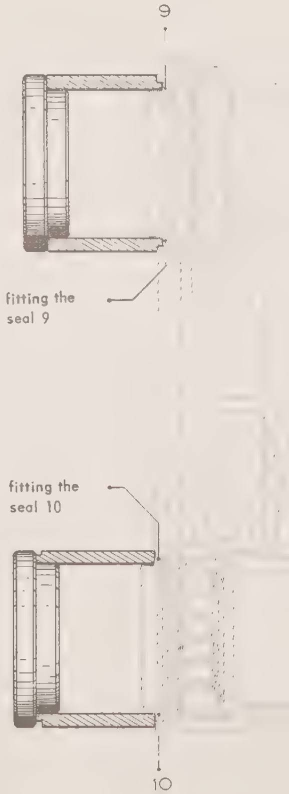


Fig. 2 — METHOD OF USING THE MANDREL MR-3676-150

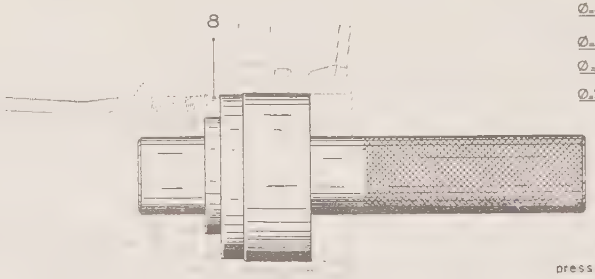


Fig. 3 — MANDREL MR-3676-156

not sold

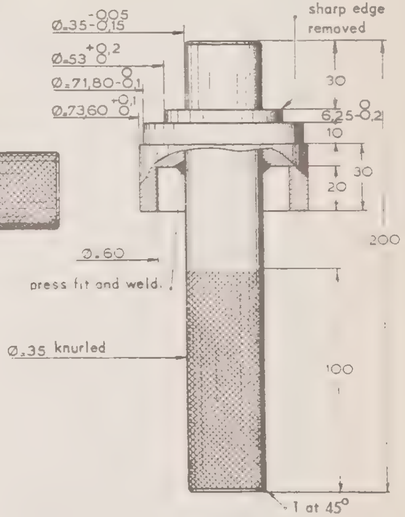
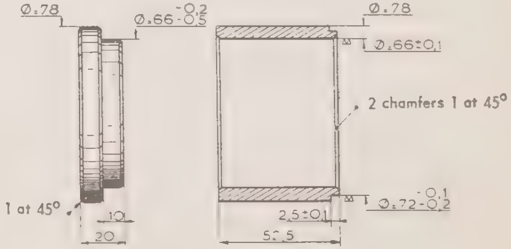


Fig. 4 — RING AND DISC MR-3676-140

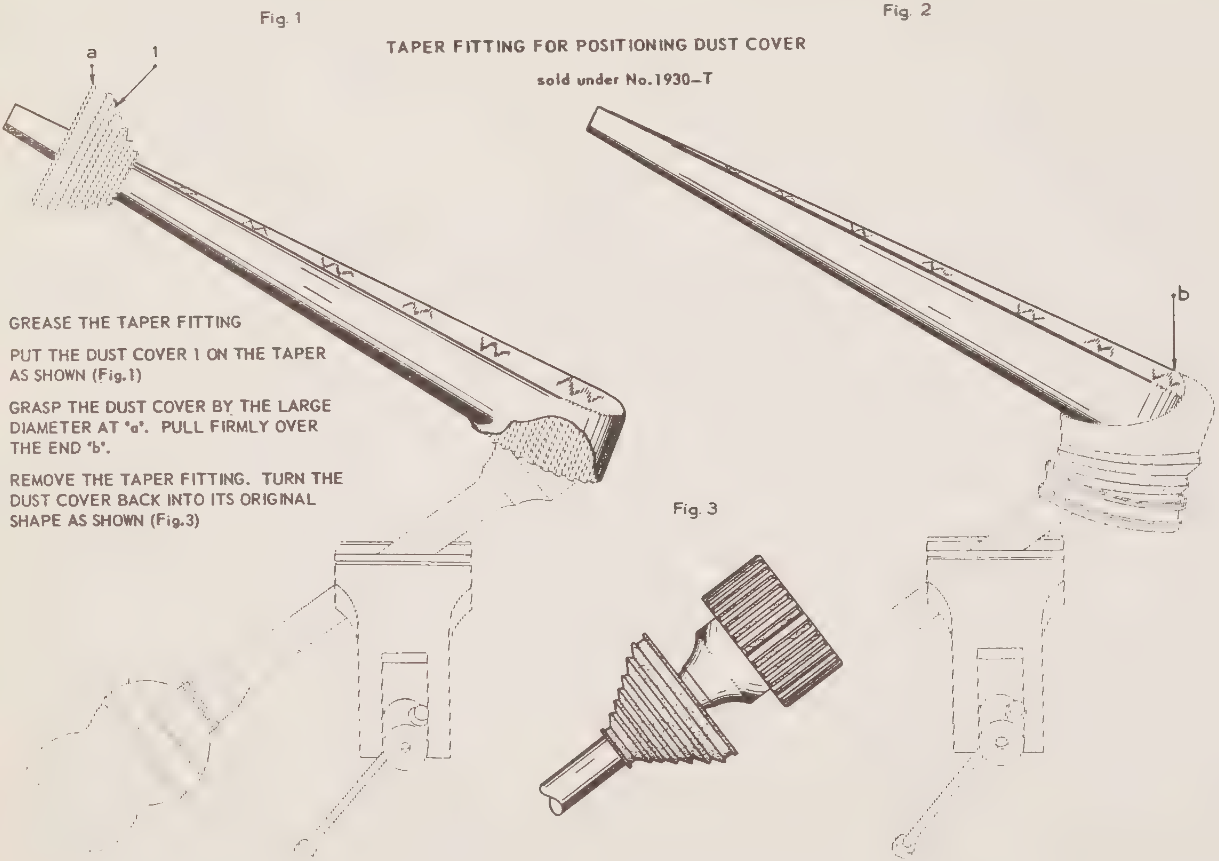
not sold



ASSEMBLY OF THE DRIVE SHAFT DUST COVER

TAPER FITTING FOR POSITIONING DUST COVER

sold under No.1930–T



1st GREASE THE TAPER FITTING

2nd PUT THE DUST COVER 1 ON THE TAPER AS SHOWN (Fig.1)

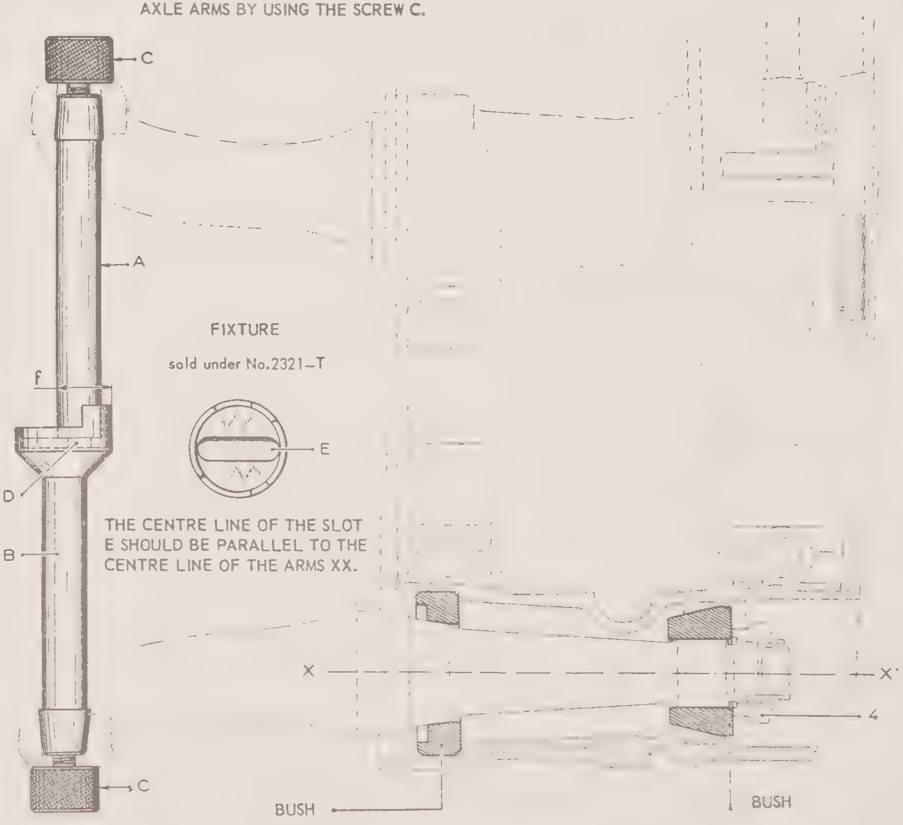
3rd GRASP THE DUST COVER BY THE LARGE DIAMETER AT 'a'. PULL FIRMLY OVER THE END 'b'.

4th REMOVE THE TAPER FITTING. TURN THE DUST COVER BACK INTO ITS ORIGINAL SHAPE AS SHOWN (Fig.3)

ADJUSTMENT OF THE CASTOR ANGLE

Fig. 1

FIX THE RODS A AND B ON THE AXLE ARMS BY USING THE SCREW C.



FIXTURE

sold under No.2321–T

THE CENTRE LINE OF THE SLOT E SHOULD BE PARALLEL TO THE CENTRE LINE OF THE ARMS XX.

BUSH

sold under No.1865–T

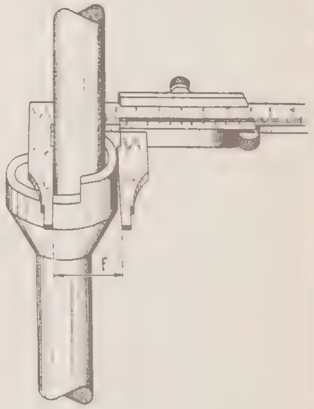
BUSH

sold under No.1866–T

BRING THE ROD A INTO CONTACT WITH THE CUP ON THE ROD B. THE HEAD D ON THE ROD A ENGAGED IN THE SLOT E ON THE ROD B.

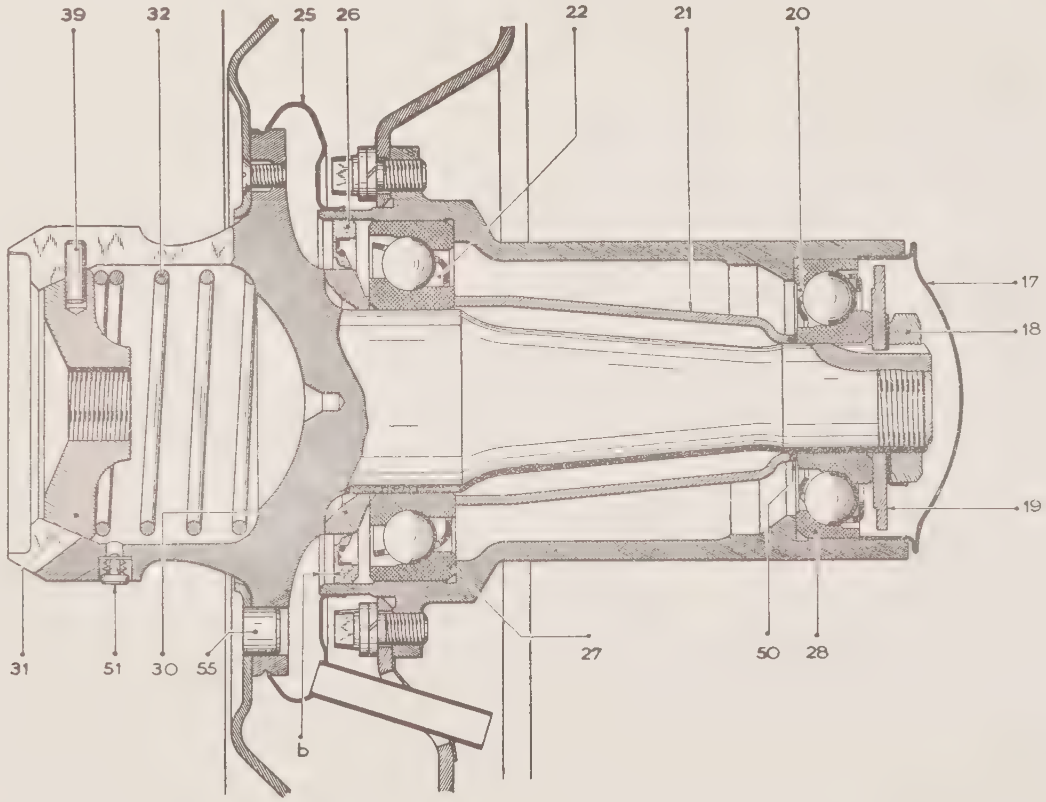
THE SETTING IS CORRECT WHEN THE DIMENSION f IS BETWEEN 24.75 AND 25.25 mm.

Fig 2

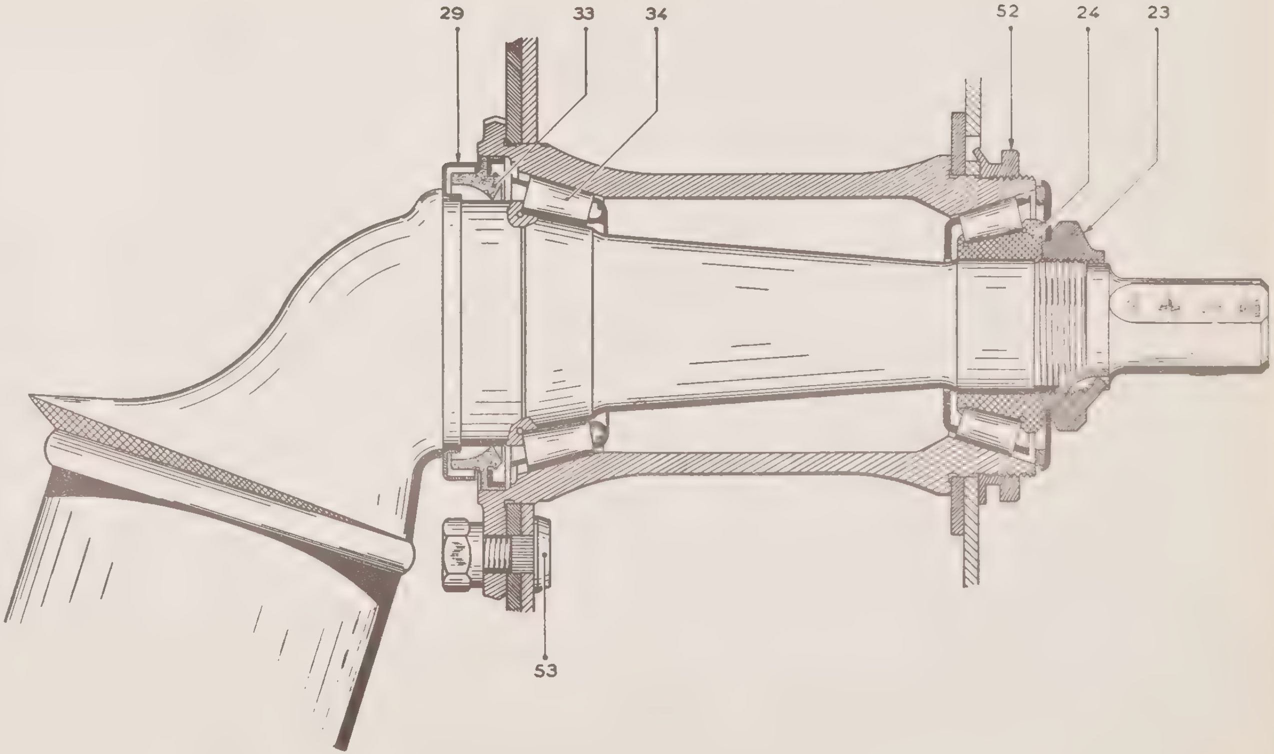


NOTE: THE DIMENSION f MUST BE MEASURED PARALLEL TO THE CENTRE LINE OF THE ARMS. TO ENSURE THIS, ROCK THE CALIPER GAUGE SLIGHTLY, UP AND DOWN. THE DIMENSION f IS THE SMALLEST READING ON THE VERNIER.

SECTION OF HUB



ARM PIVOT BEARING



METHOD OF SECURING THE ARM PIVOT BEARING

Fig. 1 — SPANNER

'sold under No.1757–T

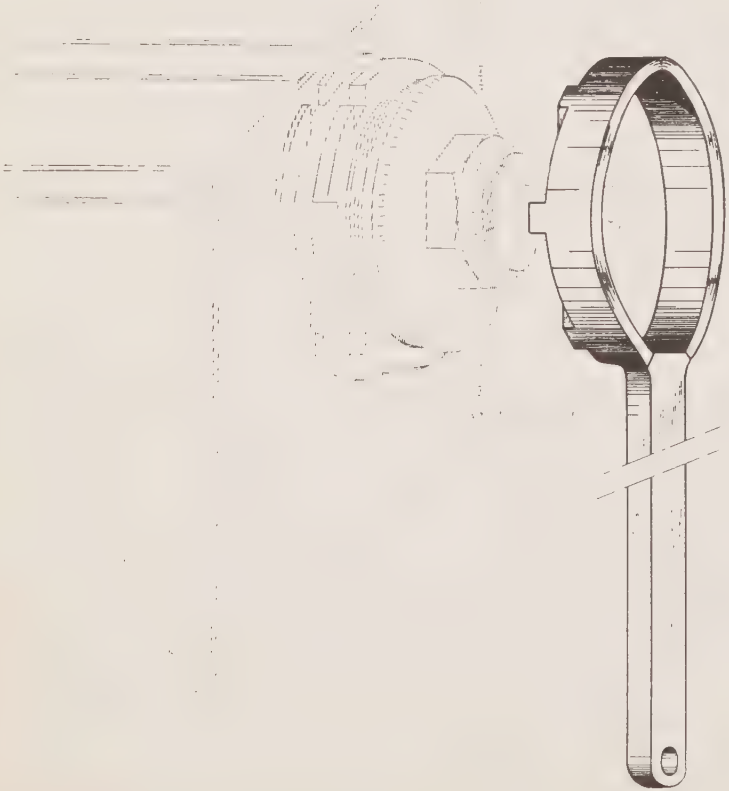
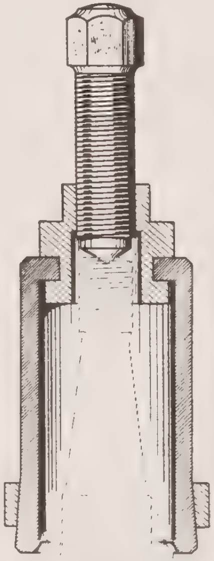
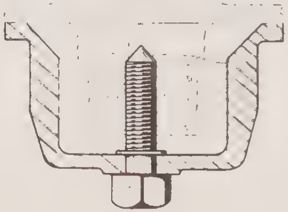


Fig. 2 — EXTRACTOR

sold under No.2020–T





SUPPORT

sold under No.1922–T

HOLDING THE ARM IN A VICE

Fig. 1 — METHOD

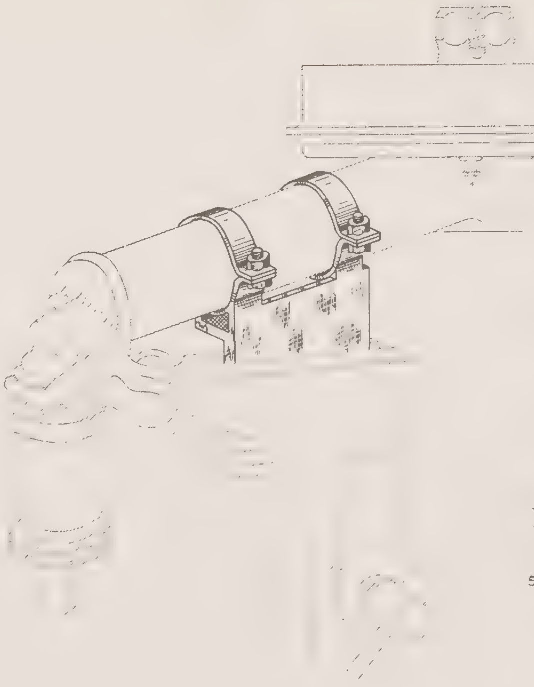
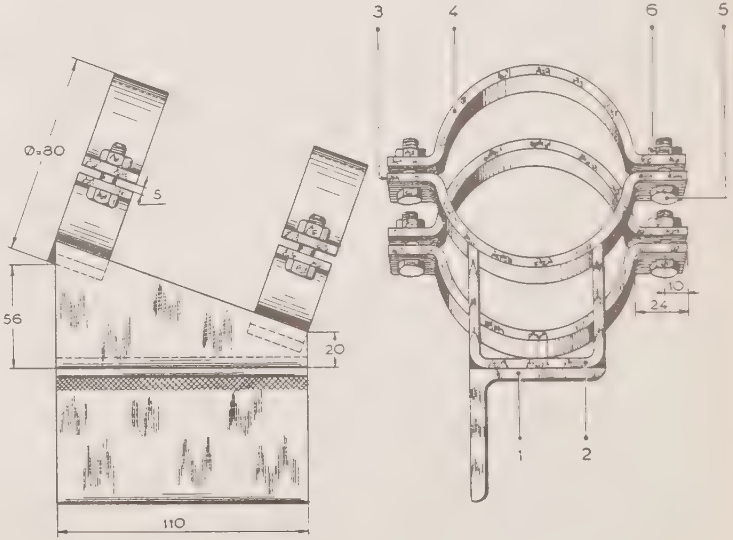


Fig. 2 — BRACKET MR-3053-90

not sold

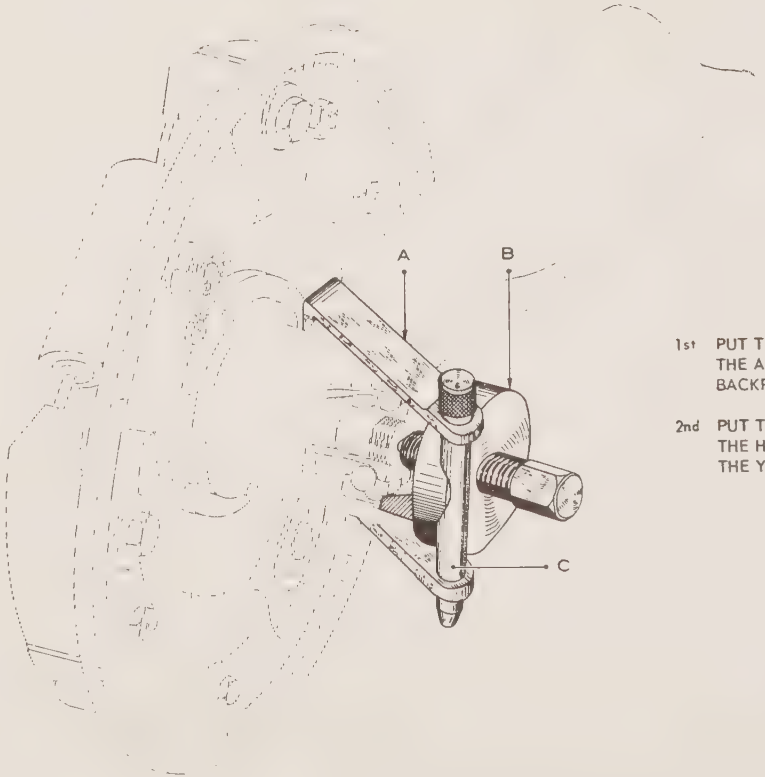
1. 1 angle iron 60 x 60 x 6, 110 mm long
2. 1 sheet steel 4 mm thick developed length 170 mm
3. 2 split collars 4 mm thick, 25 mm wide, developed length 180 mm
4. 2 split collars 4 mm thick, 25 mm wide, developed length 180 mm
5. 4 bolts, hex. 10 mm x 1.5 x 30 mm long
6. 4 nuts, hex. 10 mm x 1.5



EXTRACTION OF THE HUB – BRAKE DRUM

EXTRACTOR

sold under No.2018–T



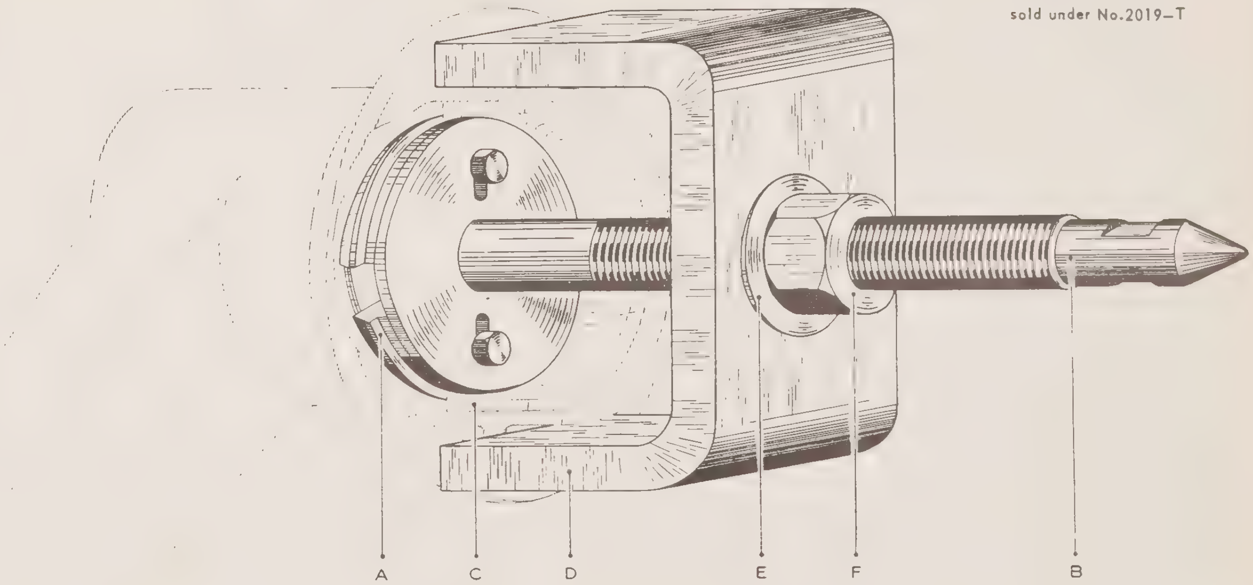
1st PUT THE YOKE A BETWEEN THE ARM AND THE BRAKE BACKPLATE.

2nd PUT THE EXTRACTOR B ON THE HUB LOCKING IT TO THE YOKE BY THE PIN C.

EXTRACTING THE HUB BEARINGS

EXTRACTOR

sold under No.2019–T



1. PLACE THE SPLIT RING A, WITHOUT THE SPINDLE B, BEHIND THE RING C
2. PUT THE SPINDLE B IN THE SPLIT RING A SO AS TO SPREAD AND LOCATE THEM
3. FIT THE U PIECE D, THE WASHER E, SCREW UP THE NUT F

NOTE: THE SPINDLE IS FITTED FROM THE INSIDE OF THE HUB

ADJUSTMENT OF BEARING CLEARANCES

Fig. 1 – CALIBRATION OF DIAL GAUGE WITH BEARING

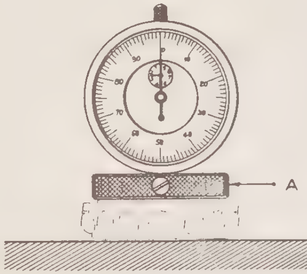


Fig. 3 – FITTING THE BEARING OUTER RACES

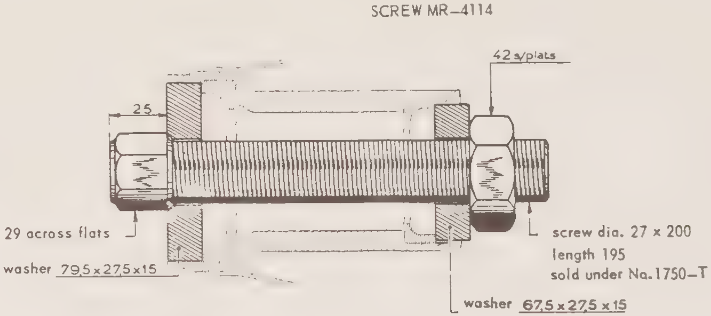
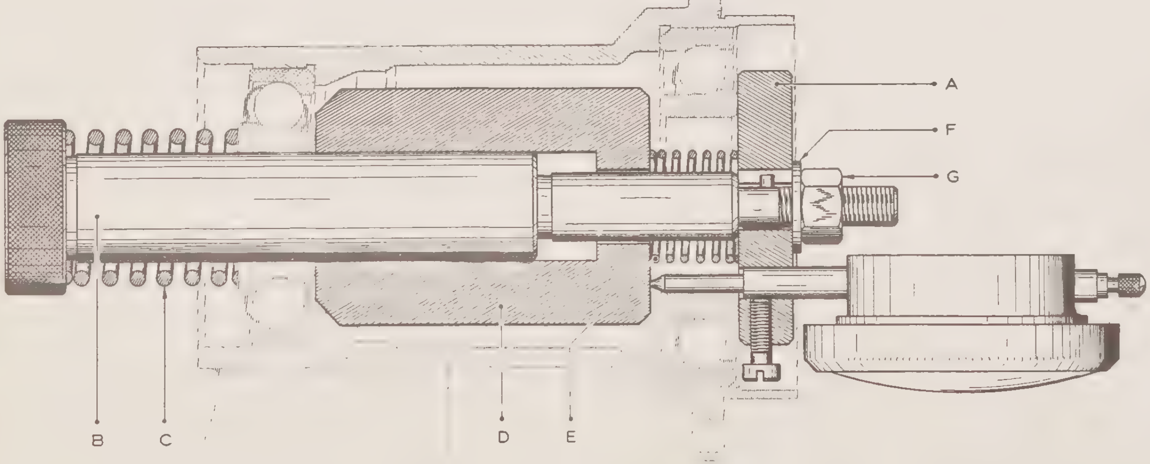
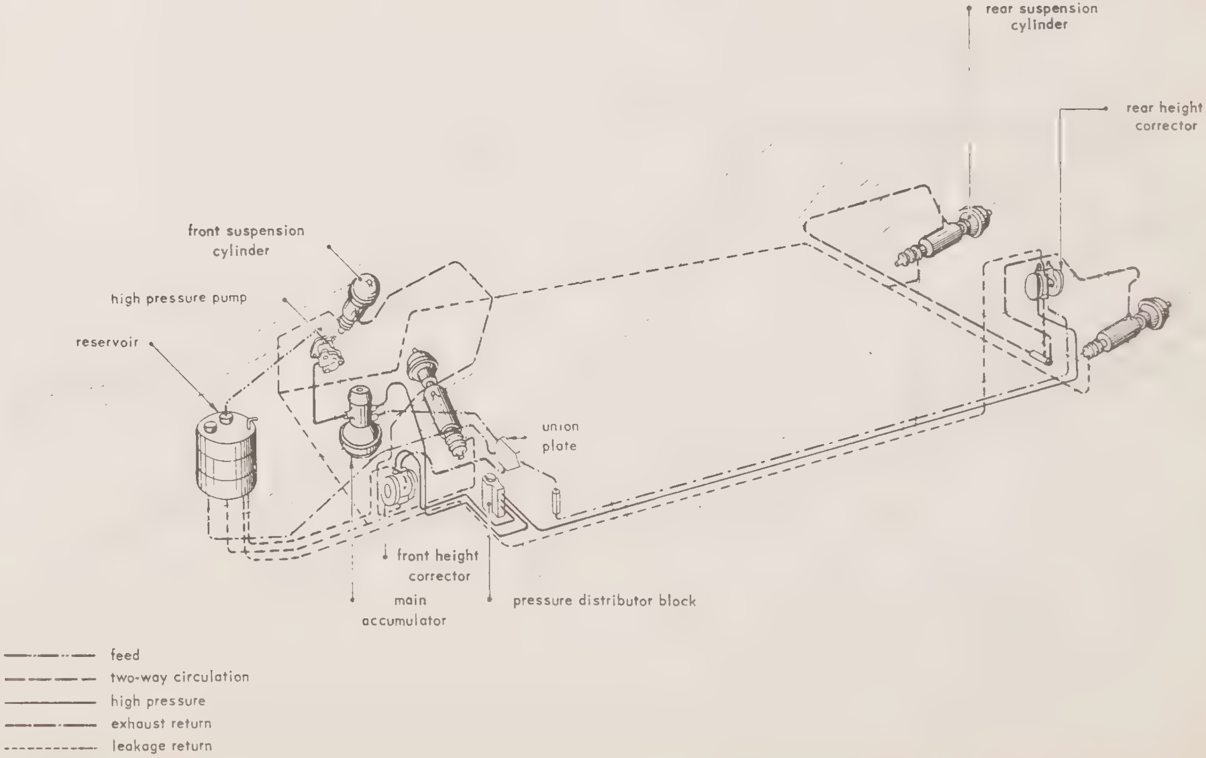


Fig. 2 EQUIPMENT FOR ADJUSTMENT

sold under No.2021–T -T



HYDRAULIC SYSTEM



OPERATIONS
ID 372-1
ID 410-1
ID 433-0
ID 433-1
ID 433-3
ID 433-4

FRONT AXLE SUSPENSION

Fig. 3

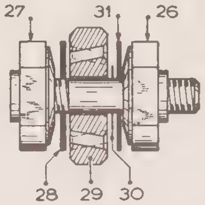


Fig. 1

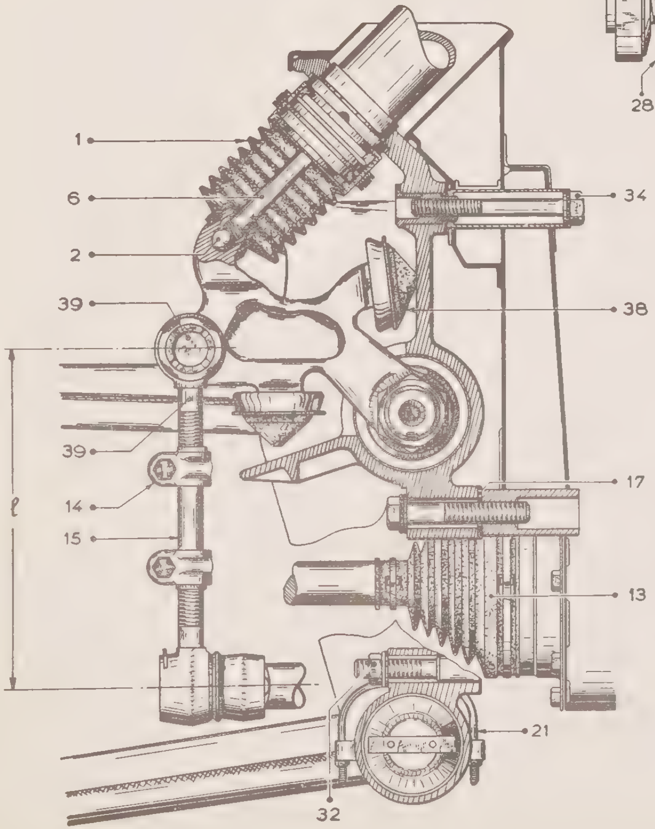
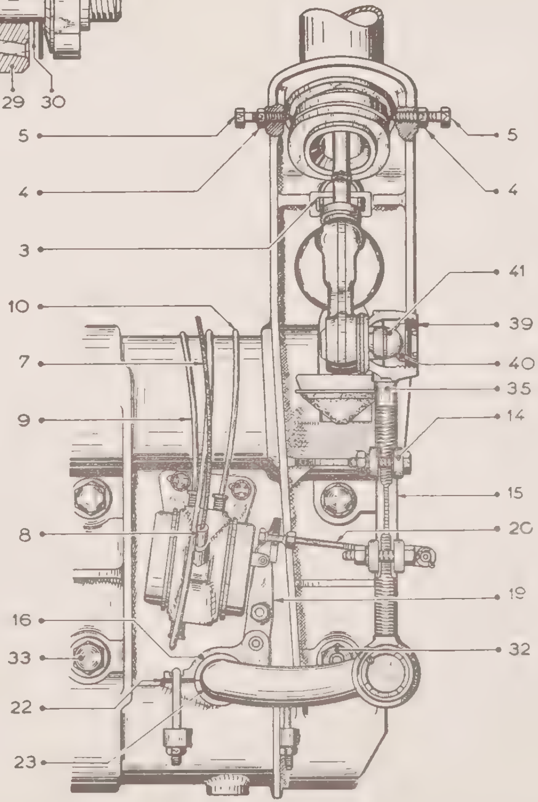


Fig. 2



OPERATIONS
ID 410-1
ID 433-0
ID 433-1
ID 433-3
ID 433-4

ANTI-ROLL BAR AND HEIGHT CORRECTOR CONTROL

Fig. 1

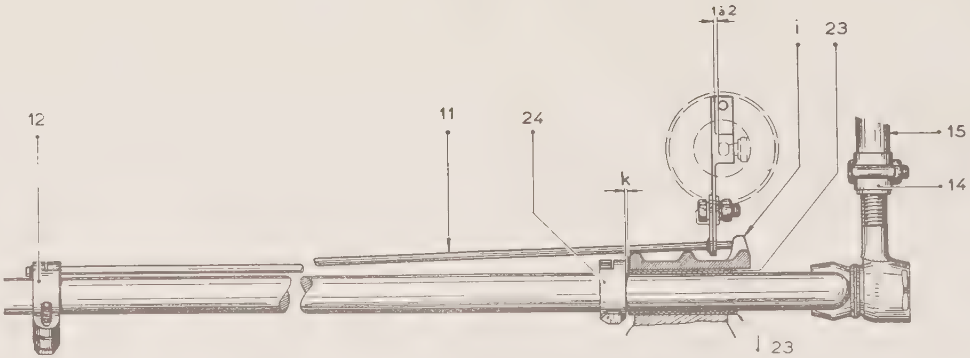


Fig. 2

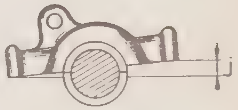


Fig 3

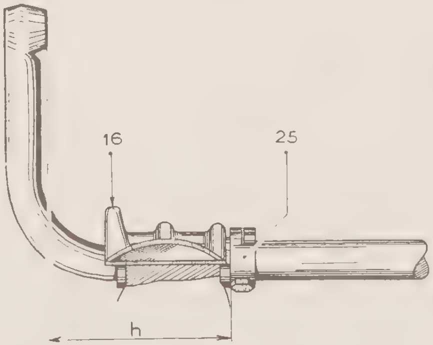


Fig 4

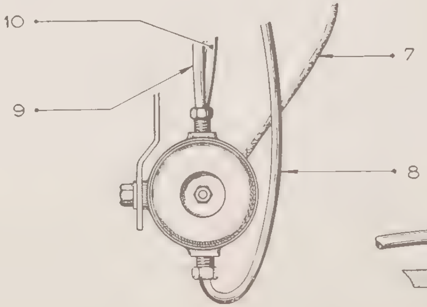
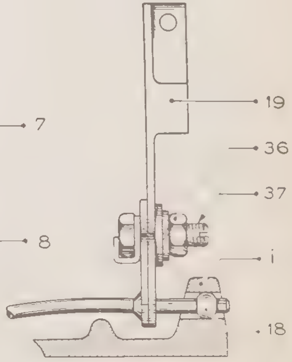


Fig 5



OPERATIONS
ID 420-1
ID 434-1
ID 434-4
ID 453-7

REAR AXLE ASSEMBLY

Fig. 1

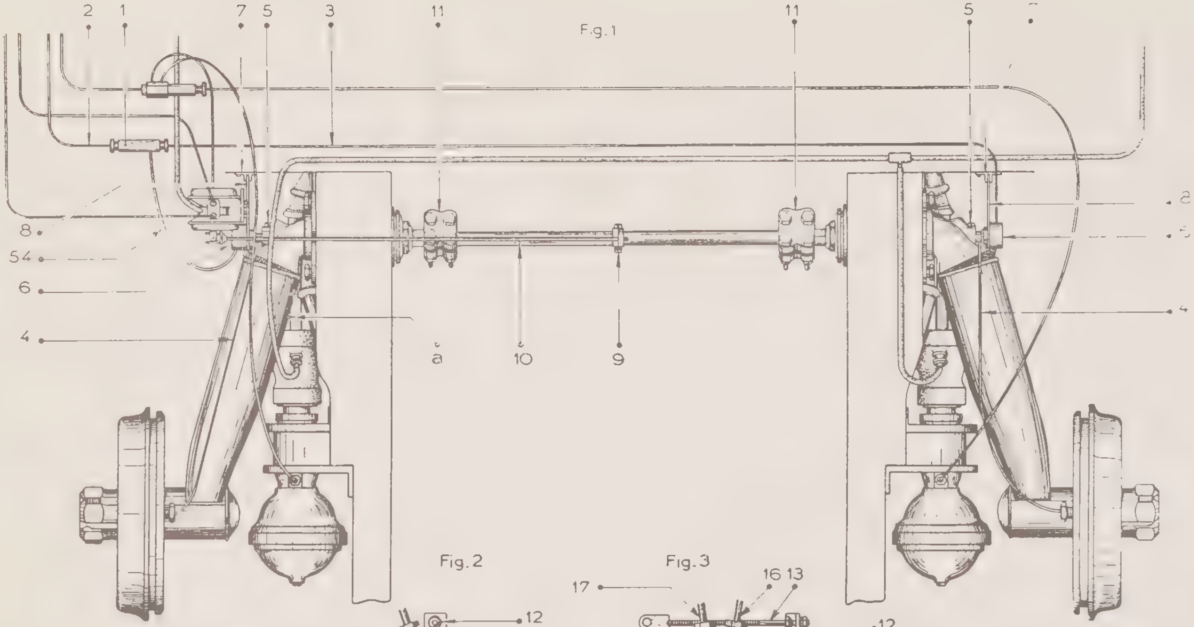


Fig. 2

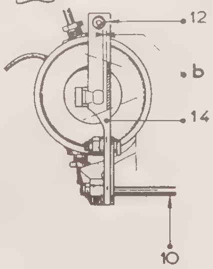
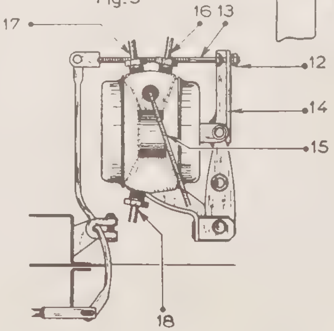


Fig. 3



OPERATIONS
ID 420-1
ID 433-0
ID 433-3
ID 434-1

REAR SUSPENSION CYLINDER

Fig. 2

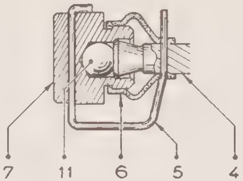


Fig. 3

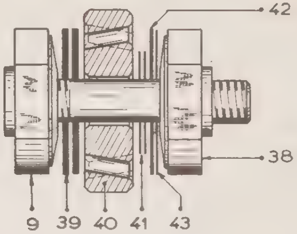
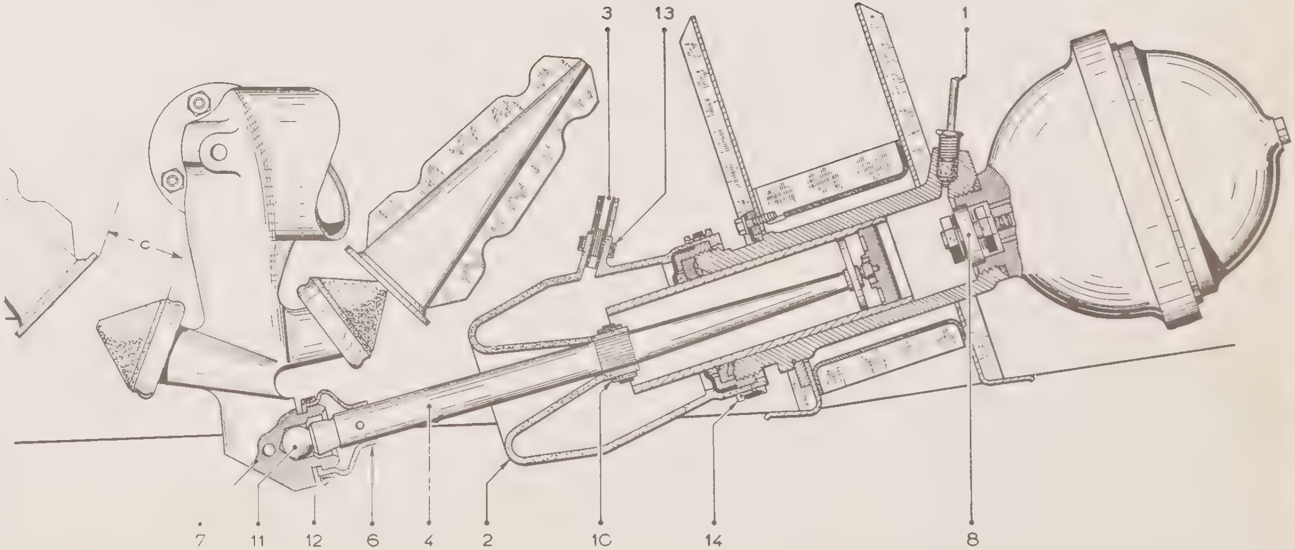


Fig. 1



MANUAL HEIGHT CONTROL GEAR

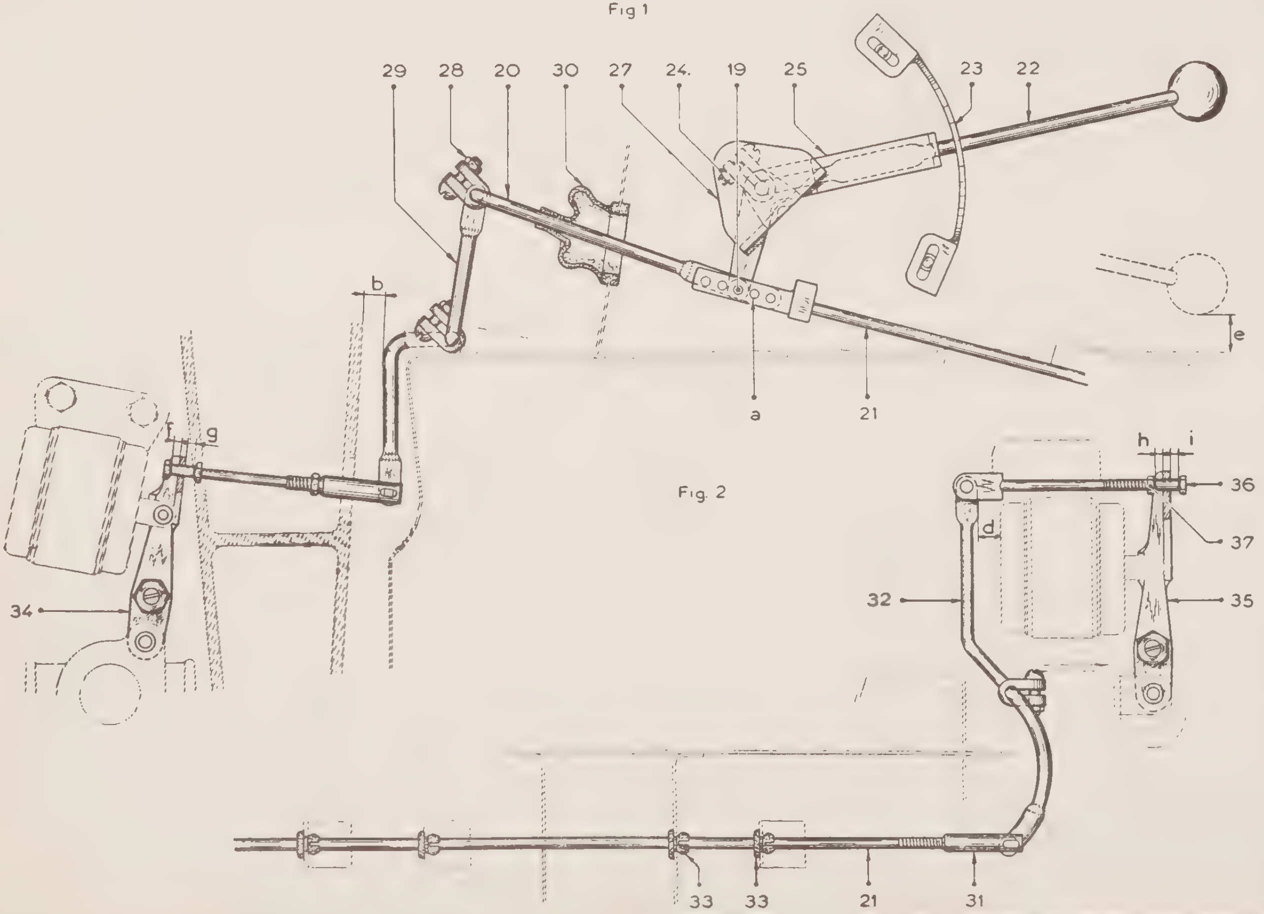


Fig 1

Fig. 2

OPERATIONS
ID 391-0
ID 391-3

HIGH PRESSURE PUMP

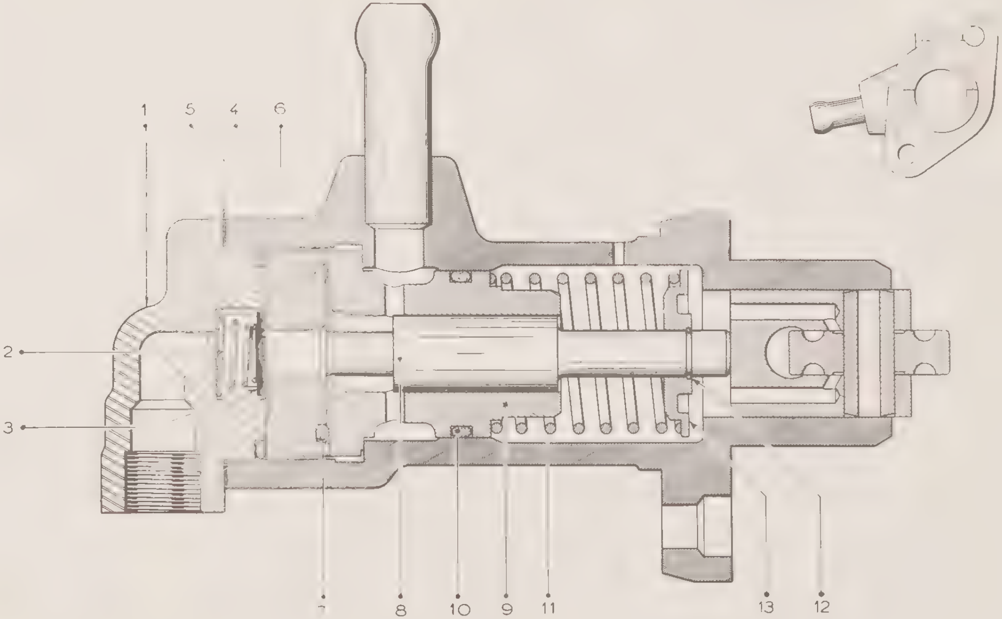


Fig 1

Fig 2

HIGH PRESSURE PUMP

Fig. 1

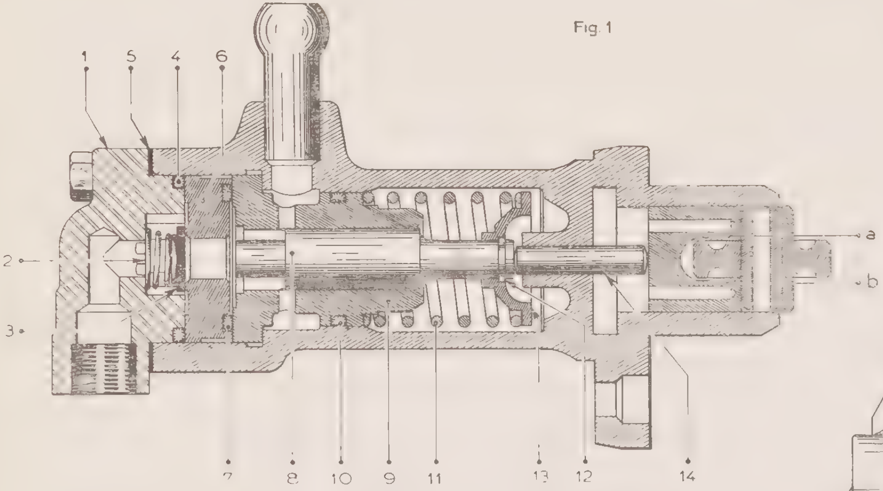


Fig. 2

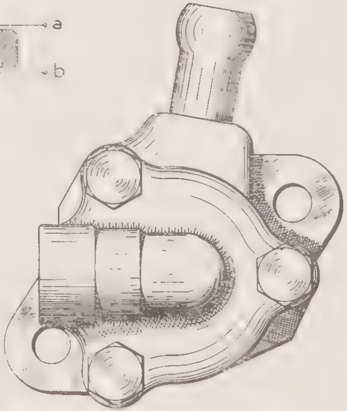
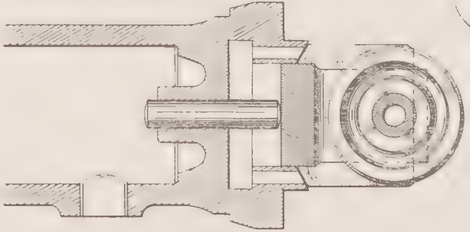


Fig 3



OPERATIONS
ID 391-0
ID 391-3
ID 393-3

PRESSURE CONTROL VALVE AND PRESSURE DISTRIBUTION BLOCK

Fig. 1

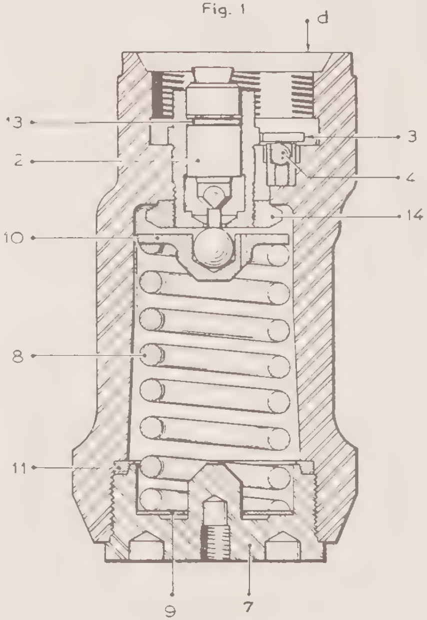


Fig. 2

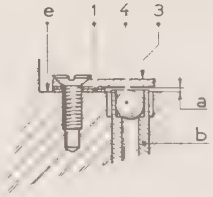


Fig 3

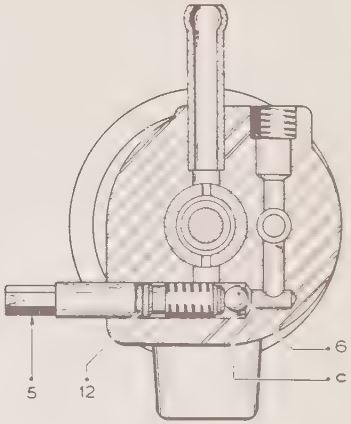
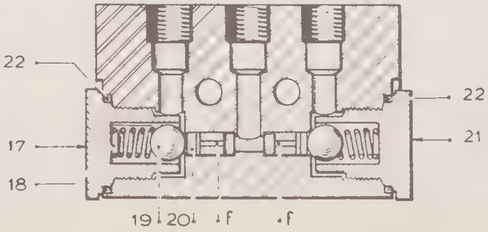


Fig 4



HEIGHT CORRECTOR – SUSPENSION CYLINDER

Fig 1

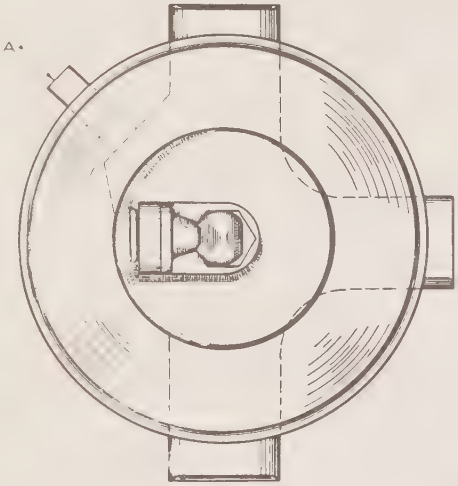


Fig 2

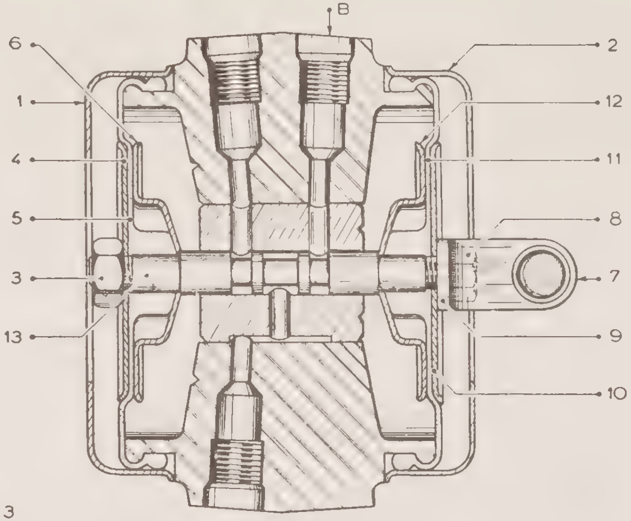
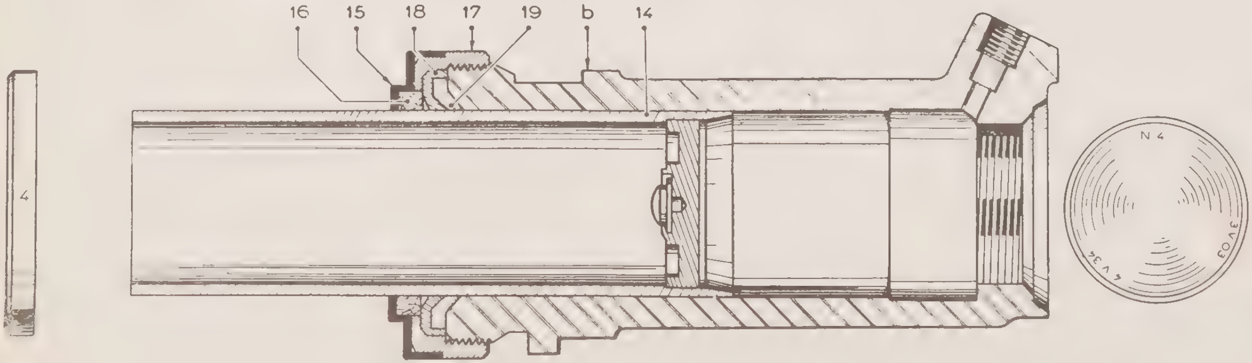


Fig 3



VARIOUS TOOLS

Fig. 1 – STRAP WRENCH

sold under No.2223–T

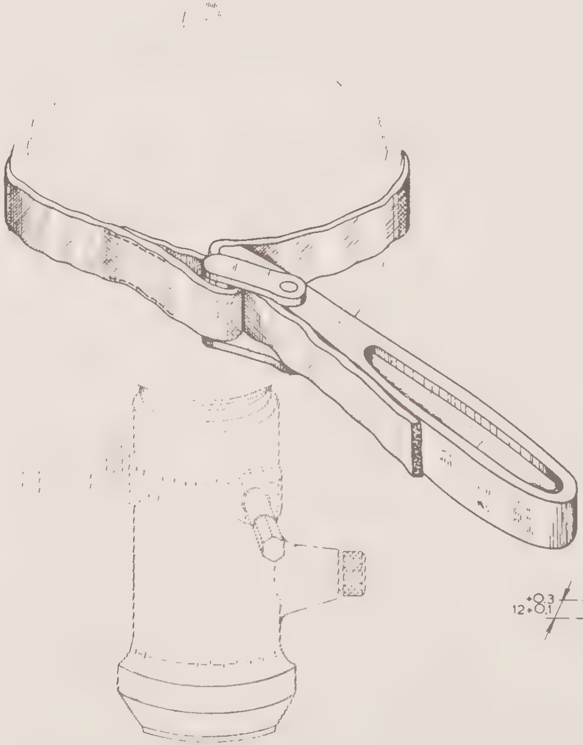


Fig. 2 – ASSEMBLY

sold under No.2224–T

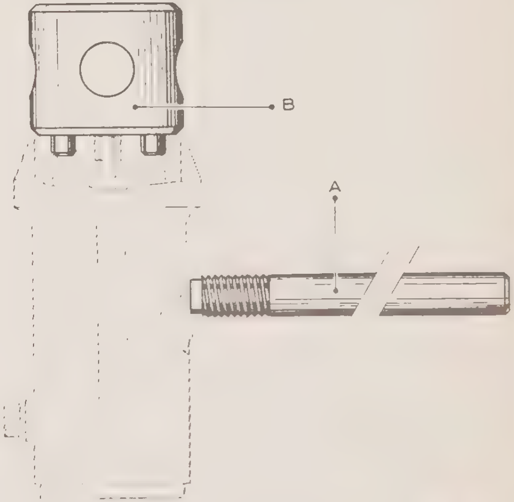
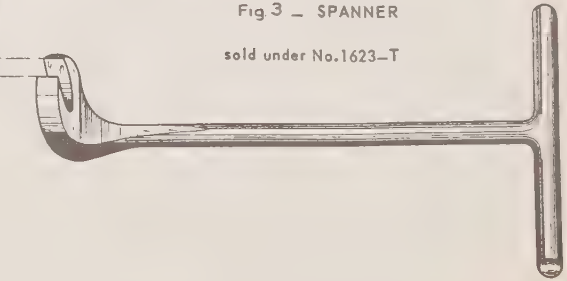


Fig. 3 – SPANNER

sold under No.1623–T



VARIOUS TOOLS

Fig 1 _ FITTING THE METAL CUPS

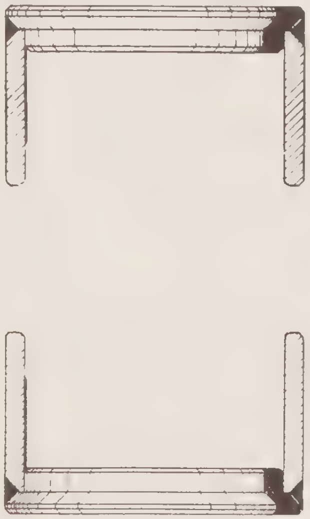


Fig 2 _ PRESS TOOL MR-3045-80

not sold

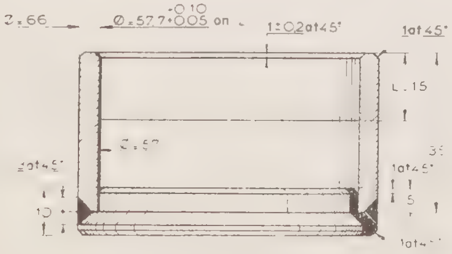
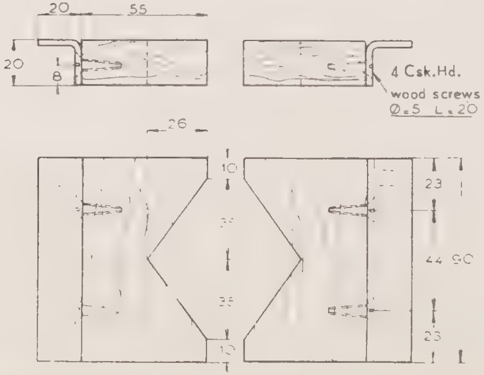


Fig 3 _ HOLDING THE CYLINDER IN A VICE

Fig 4 _ WOOD JAWS MR-3407-30

not sold



SEALING PLUGS – TAPERED SLEEVES

Fig. 1

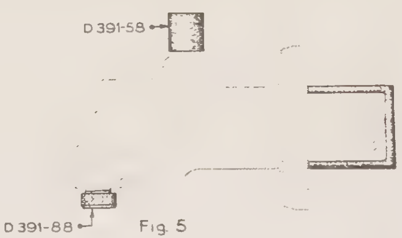


Fig. 2

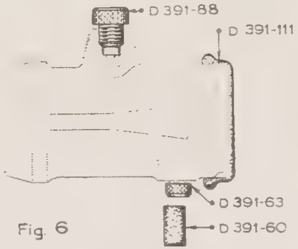


Fig. 3

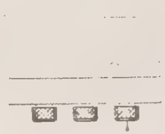


Fig. 4

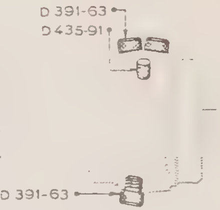


Fig. 5

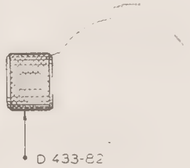


Fig. 6

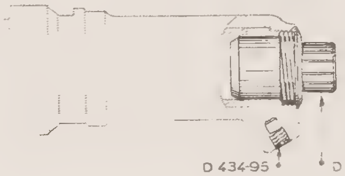


Fig 7

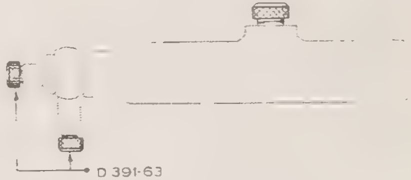


Fig. 8

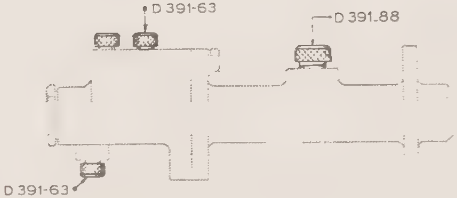
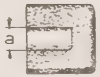


Fig. 9



D 435-91	a = 3 mm
D 453-131	a = 4,5 mm
D 453-132	a = 6,35 mm
D 391-60	a = 8 mm

Fig 10

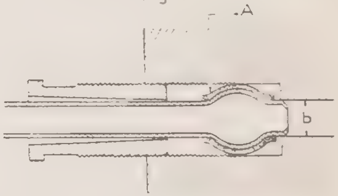


Fig. 11 – CONE

sold under No. 2225–T

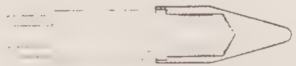


Fig. 12 – CONE

sold under No. 2226–T

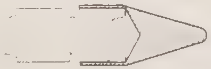
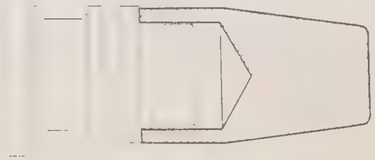


Fig. 13 – CONE

sold under No. 2227–T



OPERATIONS
ID 100-1
ID 330-1
ID 440-0
ID 441-1
ID 442-1
ID 442-3

ASSEMBLY

Fig. 1

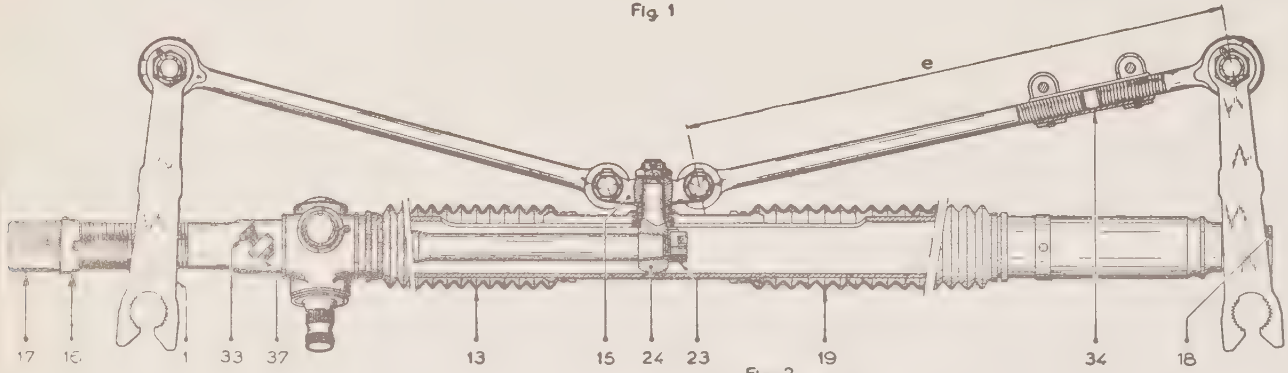


Fig. 2

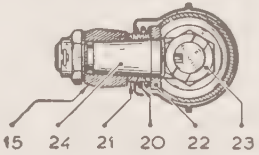


Fig. 3

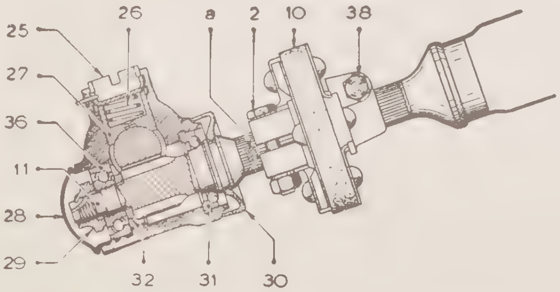
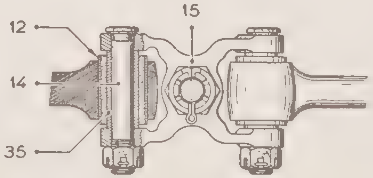


Fig. 4



FITTING THE STEERING WHEEL

Fig. 1 _ COMPRESSING TOOL

sold under No. 1991-T

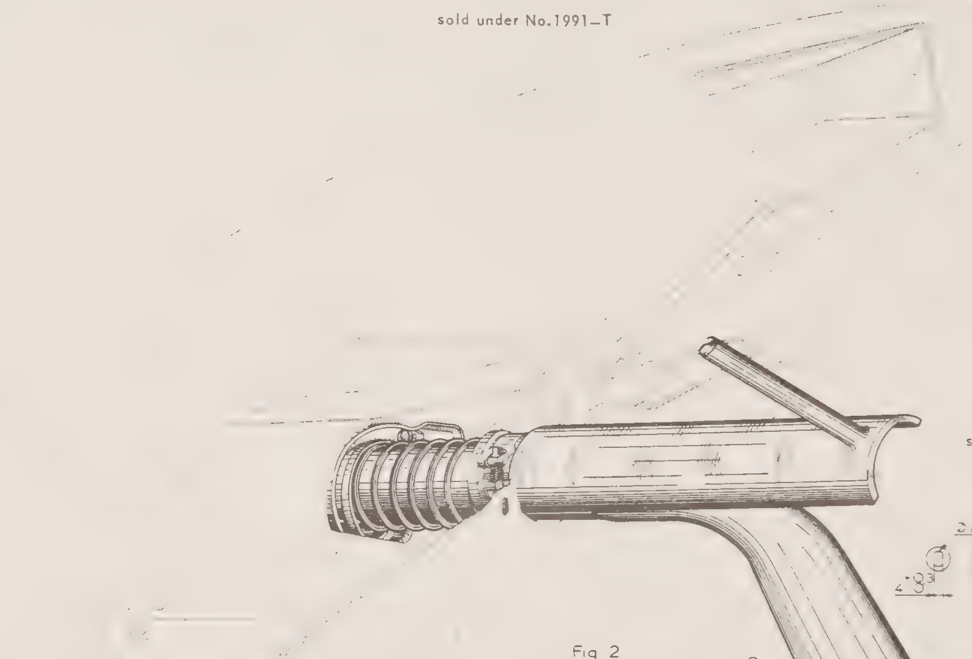


Fig. 3 _ SPANNER

sold under the No. 1994-T

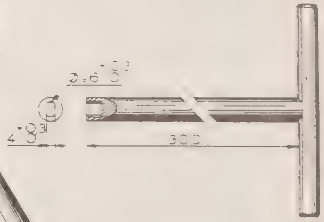
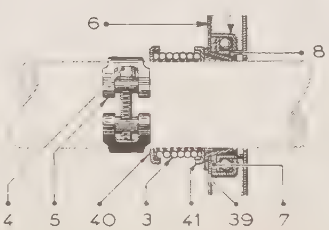


Fig 2



VARIOUS TOOLS

Fig. 1 _ EXTRACTOR

sold under No.1966-T

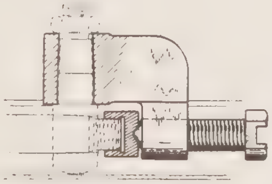


Fig. 2 _ EXTRACTOR

sold under No.1967-T

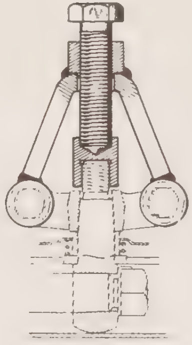


Fig. 3 _ SPANNER

sold under No.1987-T

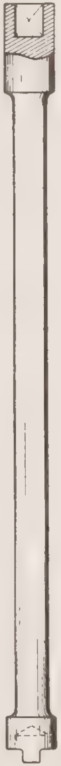


Fig. 4 _ SPANNER

sold under No.1854-T

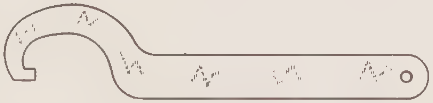
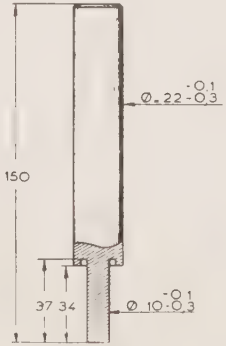


Fig. 5 _ MANDREL MR-3676-110

not sold



OPERATIONS
ID 100-1
ID 330-1
ID 440-0
ID 442-1

VARIOUS TOOLS

Fig 1 _ SUPPORT

sold under No.1999–T

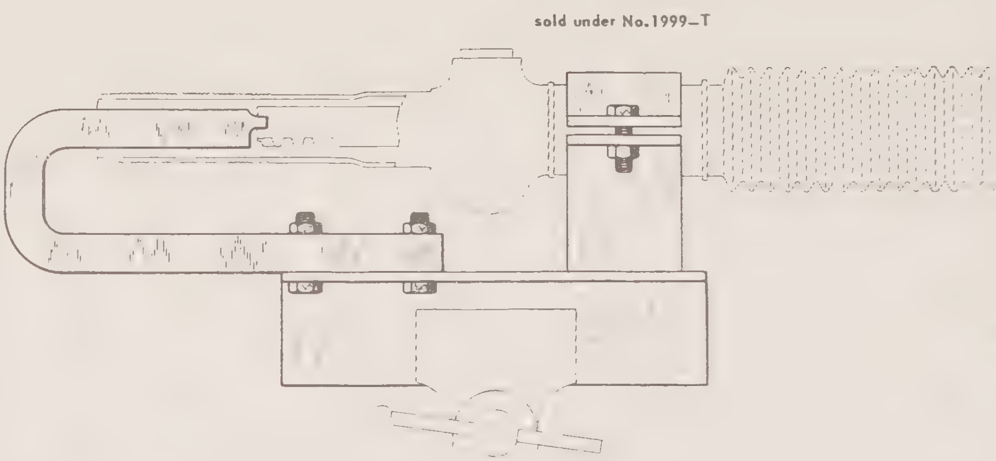


Fig. 3

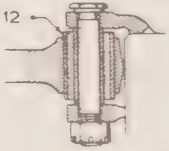
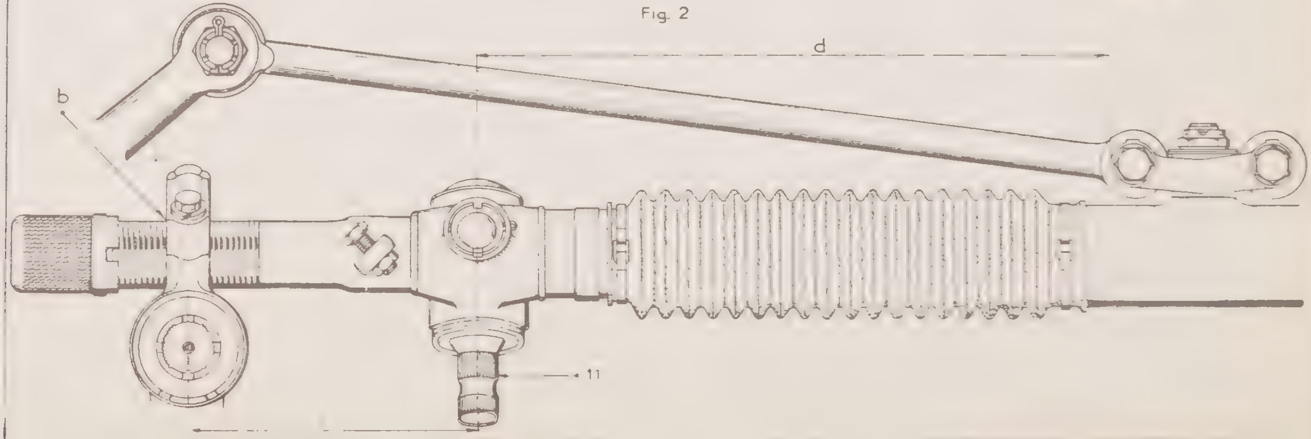
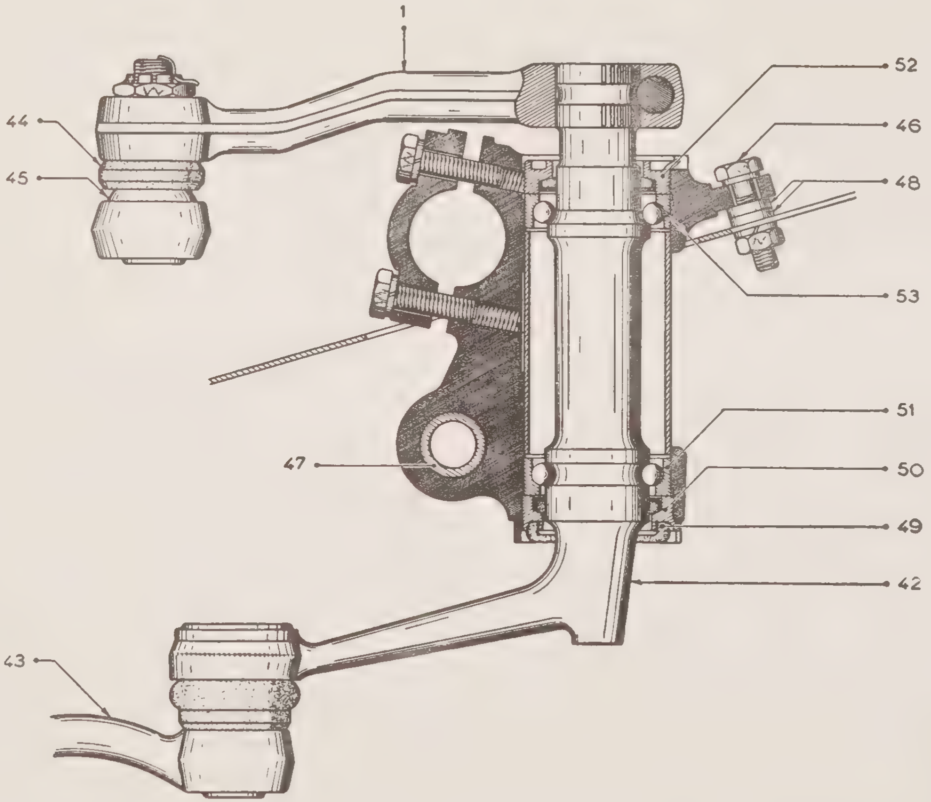


Fig. 2

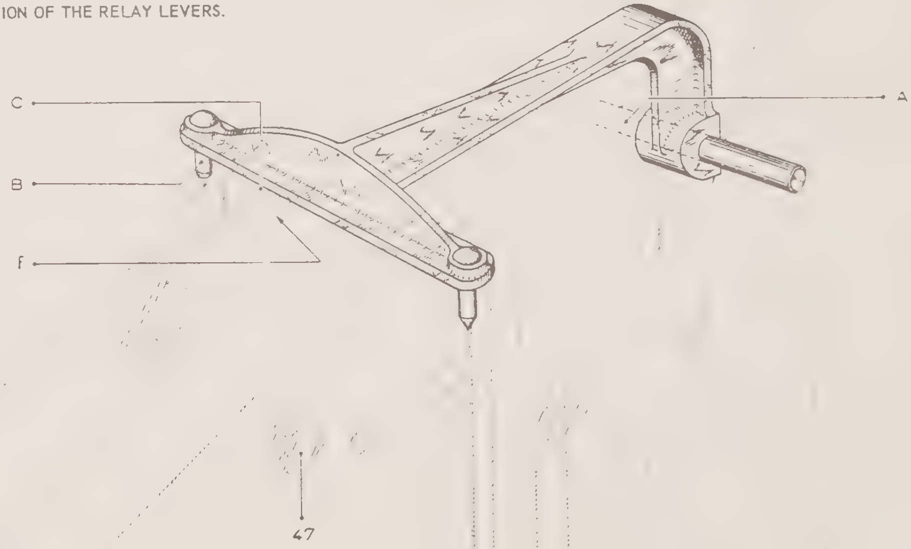


SECTION OF THE RELAY



ADJUSTING THE POSITION OF A RELAY

1. FIT THE SPINDLE A IN THE UPPER REAR HOLE OF THE CROSSMEMBER.
2. FIT THE POINT OF THE GAUGE PIN B IN THE CENTRE POINT OF THE RELAY SPINDLE.
3. DETERMINE THE THICKNESS OF THE ADJUSTING WASHER 62 TO BE FITTED AT f.
4. FIT THE WASHER 62, TIGHTEN THE SCREW C, TIGHTEN THE SPINDLE NUT 60.
5. AGAIN FIT THE FIXTURE 1995–T IN ORDER TO CHECK THE POSITION OF THE RELAY LEVERS.



FIXTURE
sold under No.1995–T

VARIOUS TOOLS

Fig. 1 – SPANNER

sold under No. 1989–T

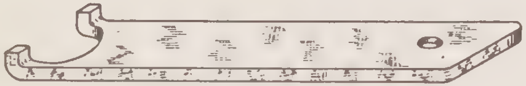


Fig. 2 – SPANNER MR–3691–70

not sold

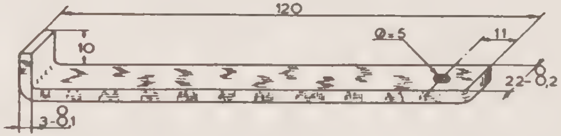


Fig. 3 – BOX SPANNER

sold under No. 1988–T

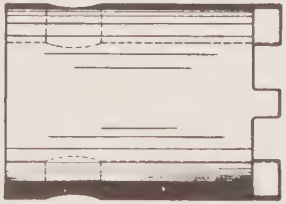
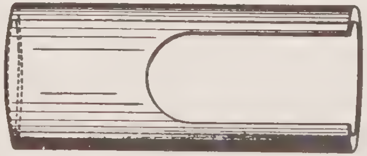


Fig. 4 – TUBE

sold under No. 1990–T



ADJUSTMENT OF THE PINION

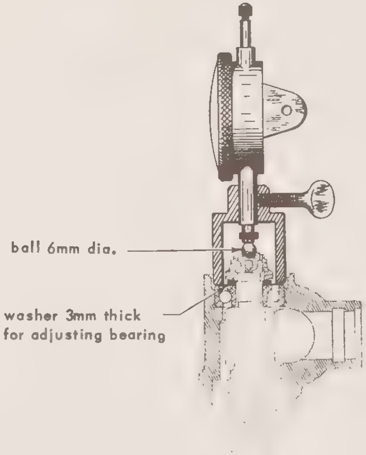
Fig. 1. SETTING THE DIAL GAUGE

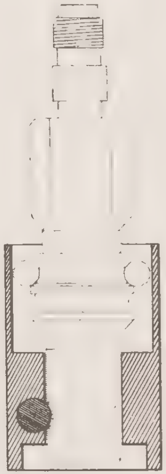
Fig. 2. MEASURING THICKNESS OF ADJUSTING WASHER

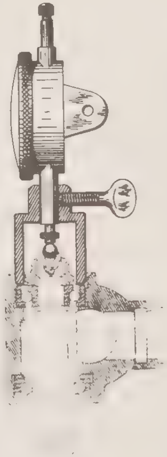
Fig. 3. FITTING THE BALL BEARINGS IN POSITION

FIXTURE

sold under No. 1996-T







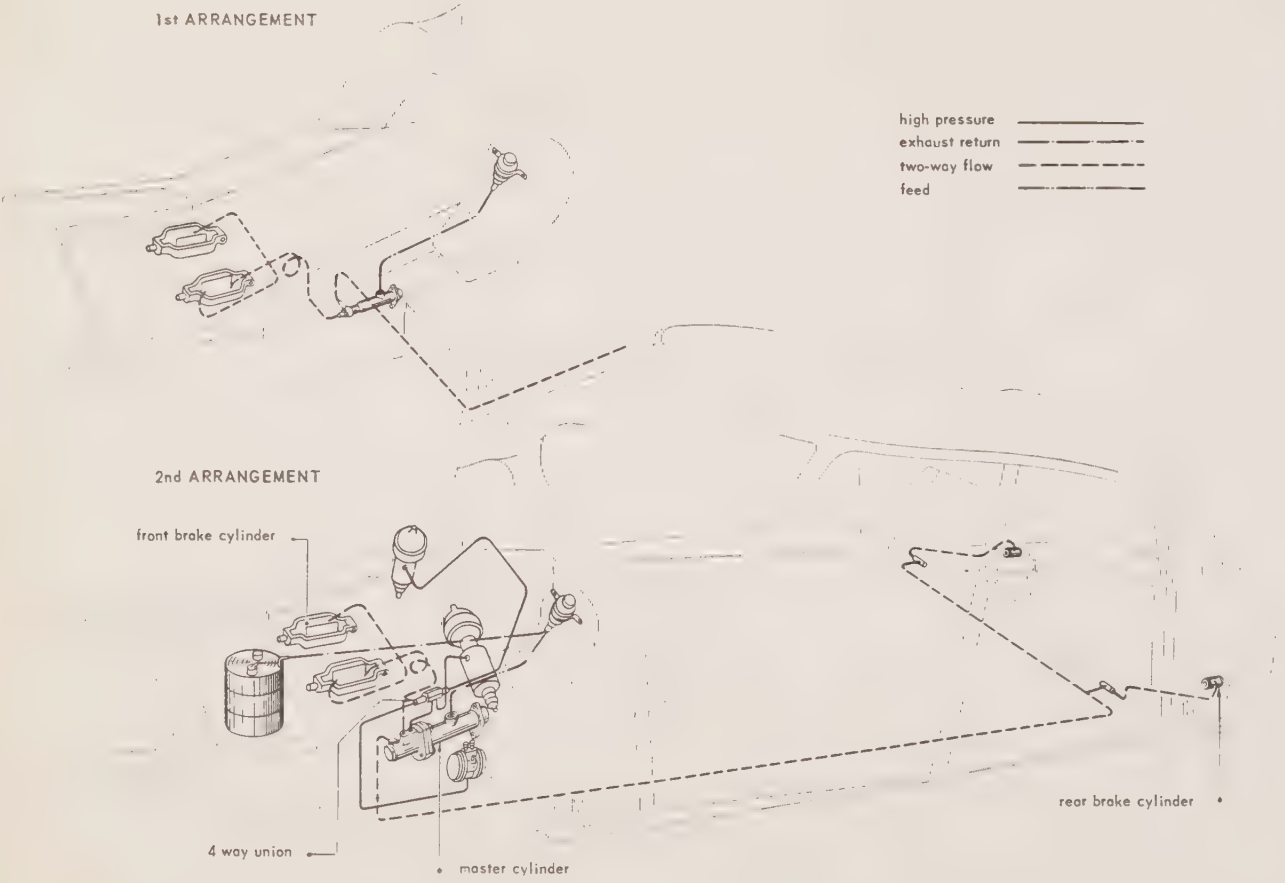
SUPPORT FOR DIAL GAUGE AND CONTACT PLUG

sold under No. 1997-T

DIAL GAUGE

sold under No. 2437-T

HYDRAULIC SYSTEM FOR BRAKES



OPERATIONS
ID 330-1
ID 330-2
ID 331-1
ID 451-0
ID 451-1
ID 451-3

FRONT BRAKE UNIT

Fig. 1

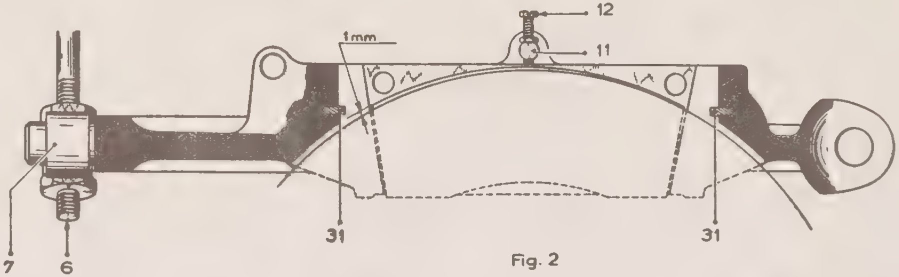
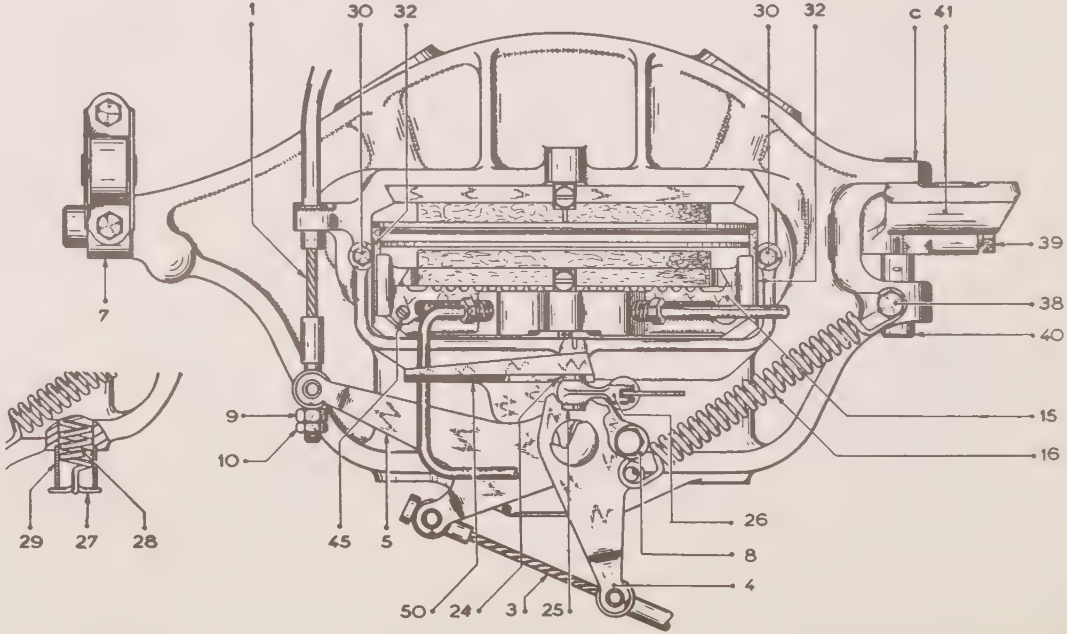


Fig. 2



OPERATIONS
ID 330-2
ID 451-0
ID 451-1
ID 451-3

FRONT BRAKE UNIT

Fig. 1

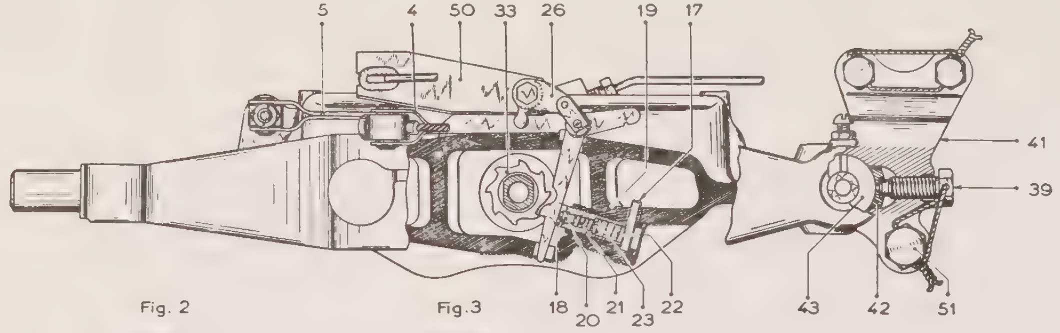


Fig. 2

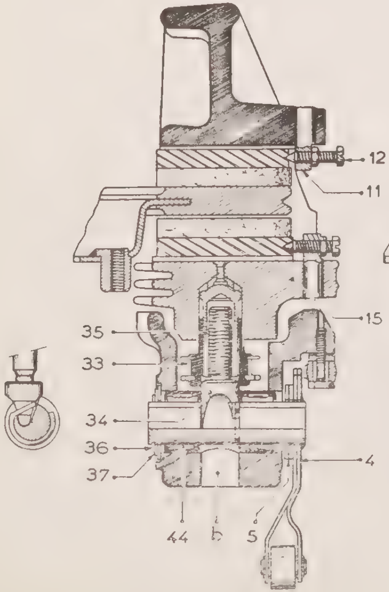


Fig. 3

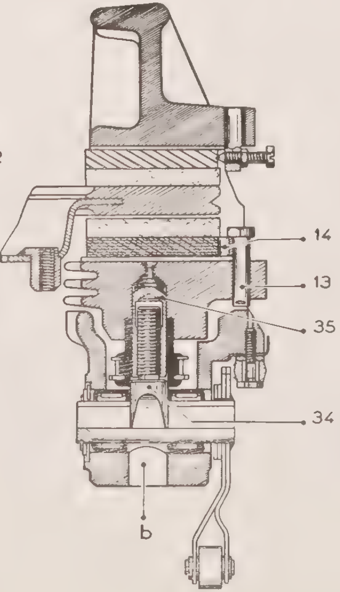


Fig. 4

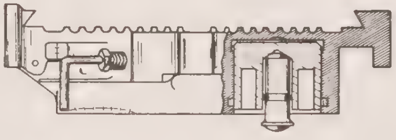
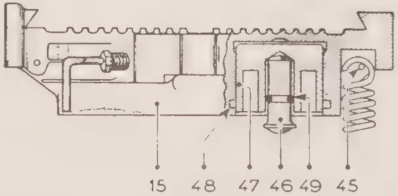


Fig 5



TOOLS FOR BRAKES

Fig. 1 – FORK

sold under No.2128–T

Fig. 2 – LEVER

sold under No.2127–T

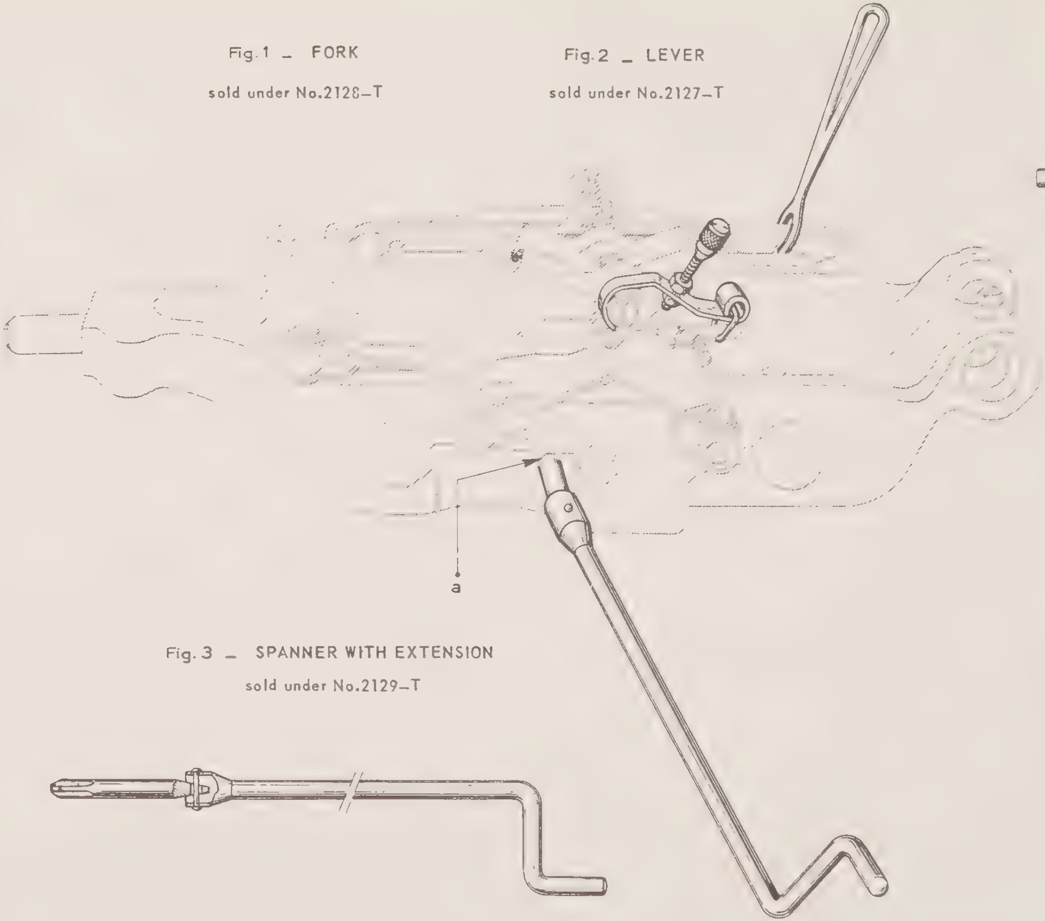
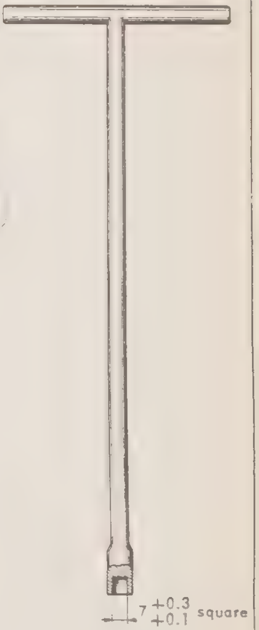


Fig. 3 – SPANNER WITH EXTENSION

sold under No.2129–T

Fig. 4 – SPANNER

sold under No.2141–T



REAR BRAKE BACKPLATE

Fig. 1

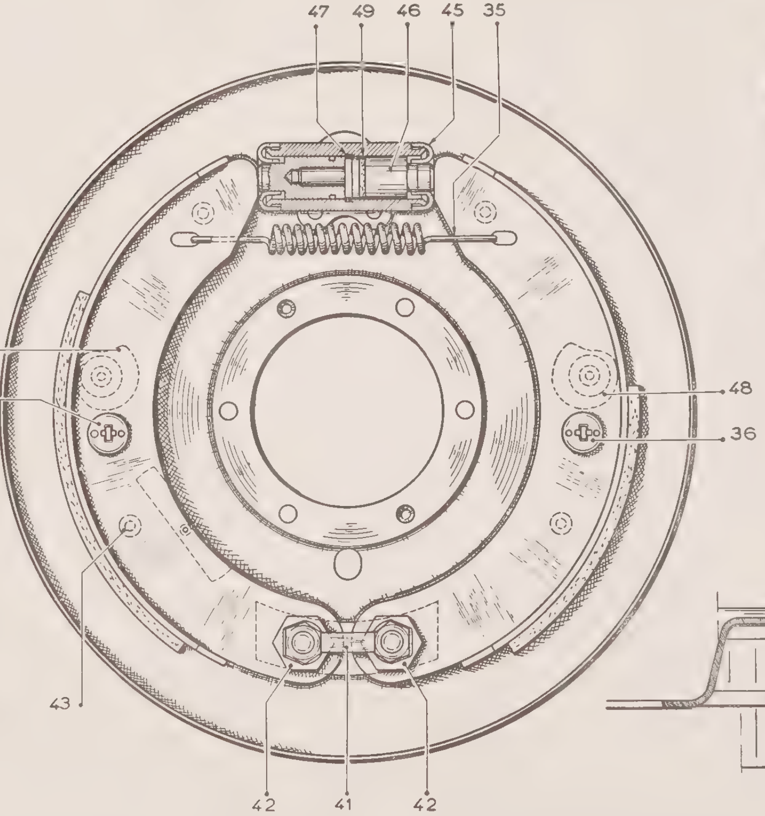


Fig 2

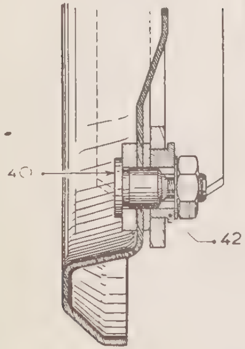


Fig. 4

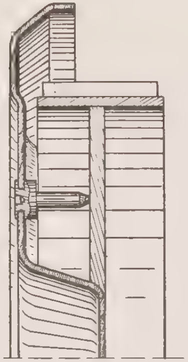
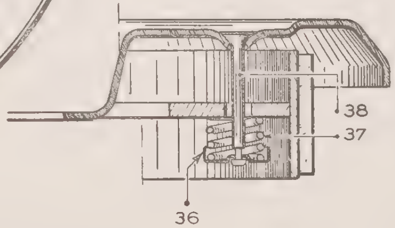


Fig. 3



REMOVING AND FITTING THE RETURN SPRINGS

Fig. 1 – METHOD OF USING PINCERS

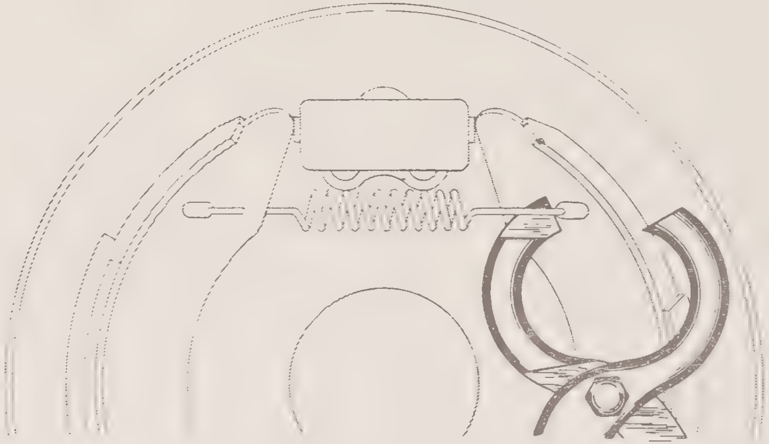
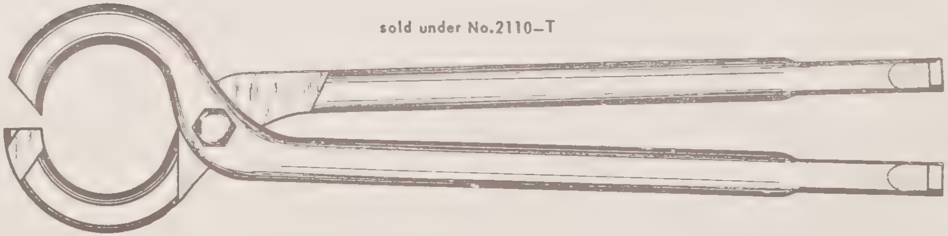


Fig. 2 – PINCERS

sold under No. 2110–T



GRINDING THE REAR BRAKE DRUM

Fig 1 _ METHOD OF USING THE MANDREL MR-3700-120

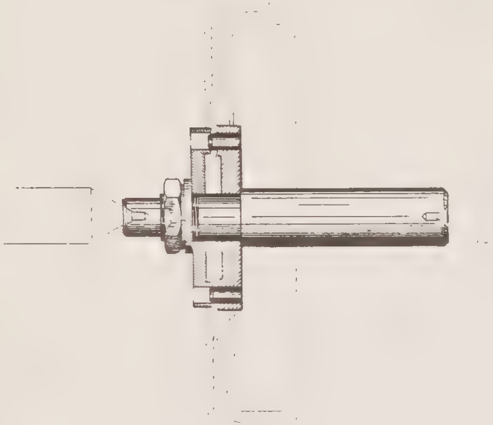


Fig. 2 _ MANDREL MR 3676-170

not sold

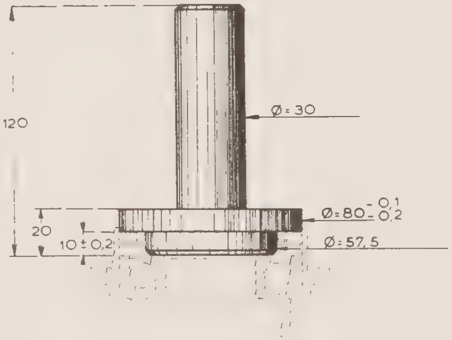
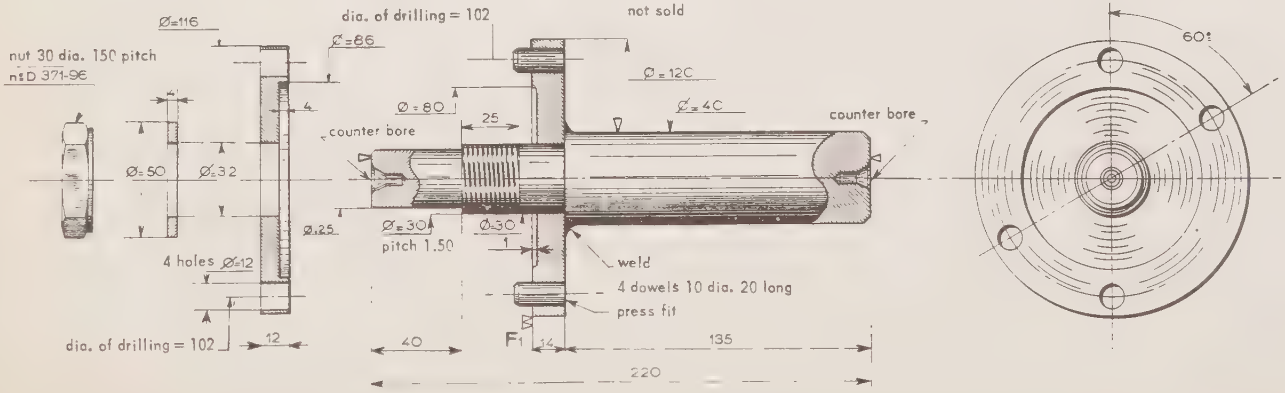


Fig. 3 _ MANDREL MR 3700-120

not sold



the face F1 must be true to the centre line within 0.02

RIVETTING THE BRAKE-CAM PINS

Fig. 1 _ METHOD OF USE

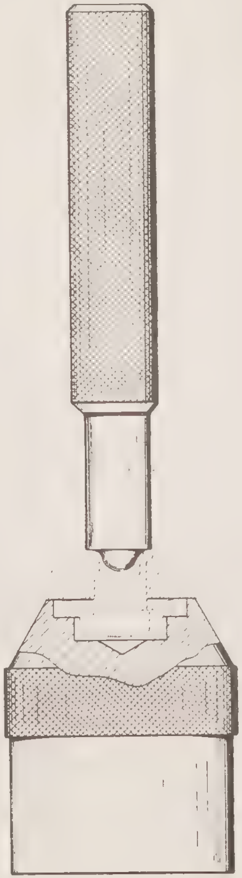


Fig. 2 _ RIVET SET MR-3354-2

not sold

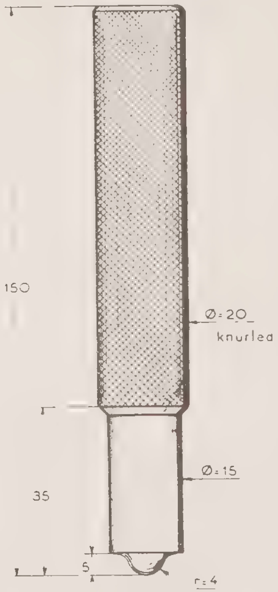
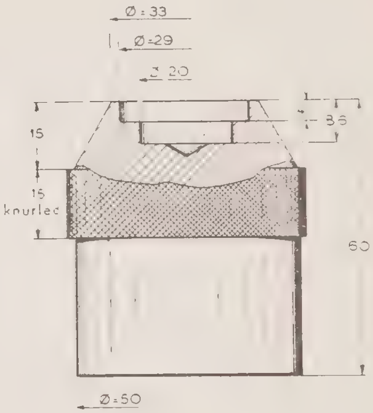


Fig. 3 _ BLOCK MR-3354-40

not sold



CENTRING THE BRAKE SHOES

Fig 1 _ SETTING TO THE DIAMETER OF THE DRUM

PLACE THE GAUGE IN THE BRAKE DRUM WITH THE TWO DOWELS ENGAGED IN THE CENTRING HOLES.

TURN THE GAUGE ONE COMPLETE REVOLUTION WITH THE INDEX B HELD AGAINST THE DRUM.

TIGHTEN THE SCREW C.

GAUGE FOR INSPECTING THE CONCENTRICITY OF THE BRAKES

sold under No.2115–T

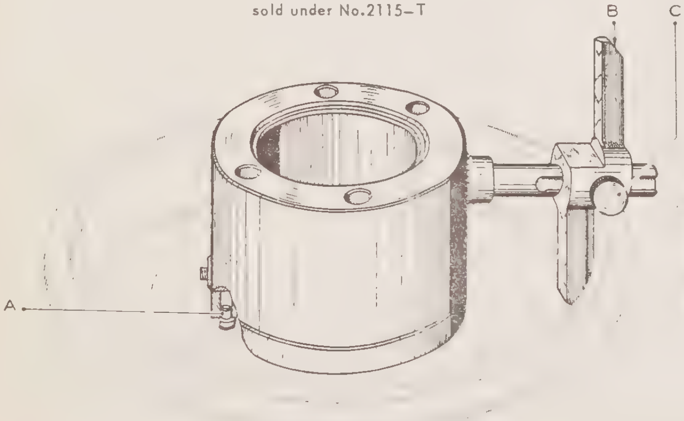
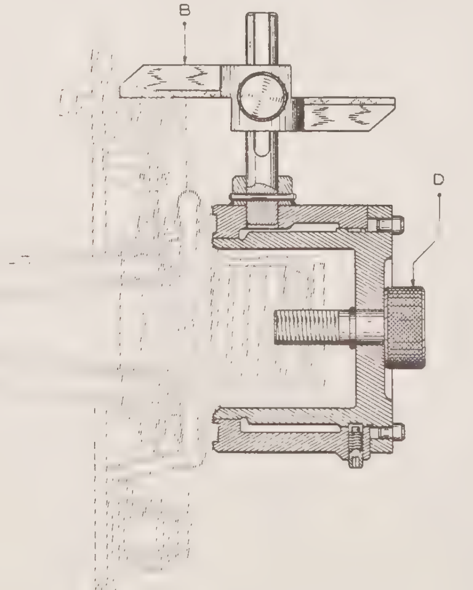


Fig. 2 _ ADJUSTMENT OF THE BRAKE SHOES

PLACE THE GAUGE ON THE HEXAGON OF THE STUB AXLE.

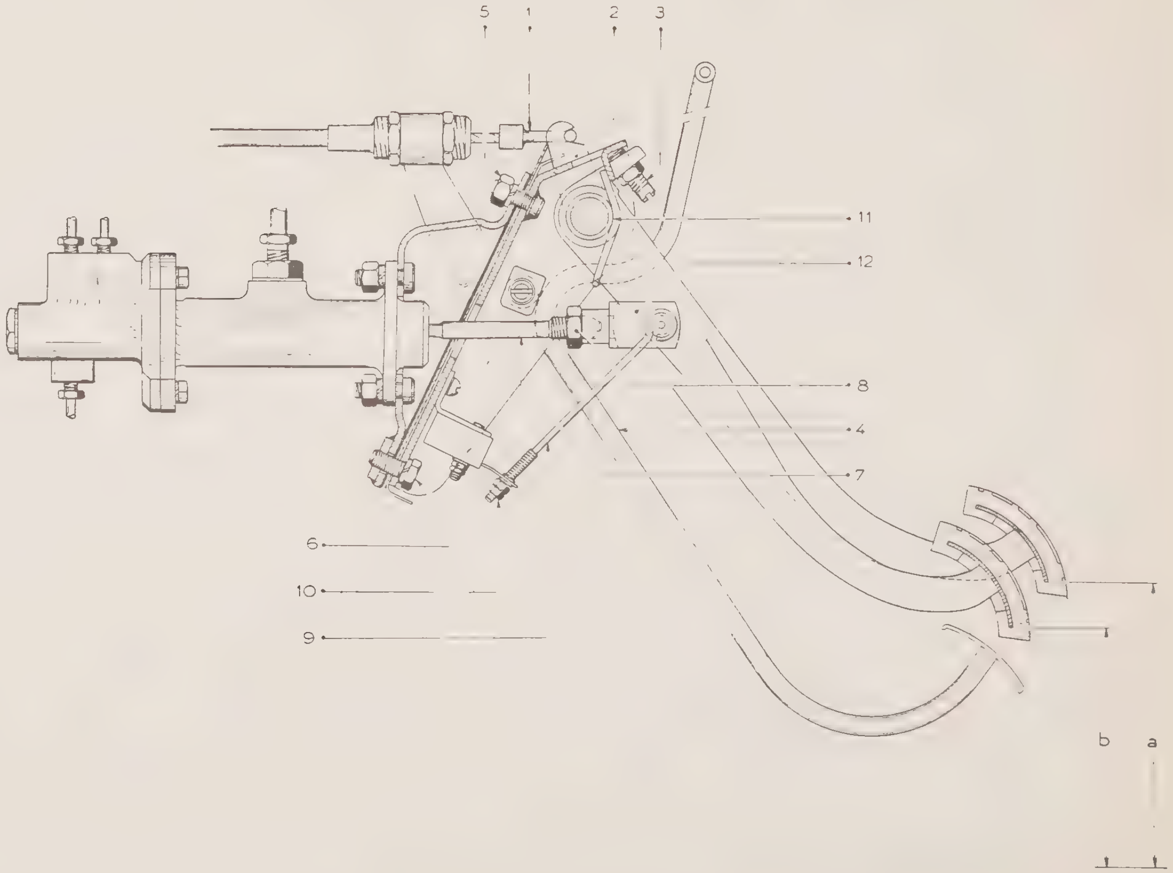
TIGHTEN THE SCREW D

MOVE THE BRAKE SHOES BY MEANS OF THE ADJUSTING CAM SO THAT THE INDEX B IS LEVEL WITH THE LINING ALL THE WAY ROUND.



AFTER INSPECTION UNSCREW THE CAMS SO AS TO ALLOW THE BRAKE DRUMS TO BE FITTED.

PEDAL GEAR



MASTER CYLINDERS

Fig. 1

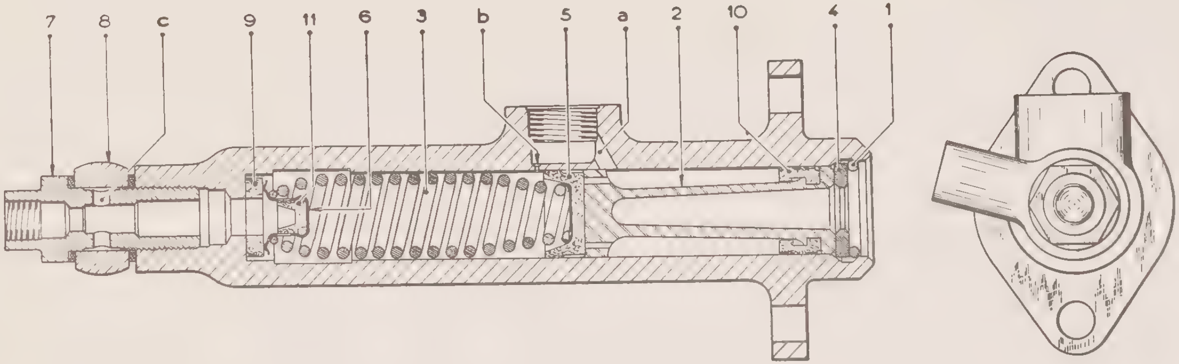
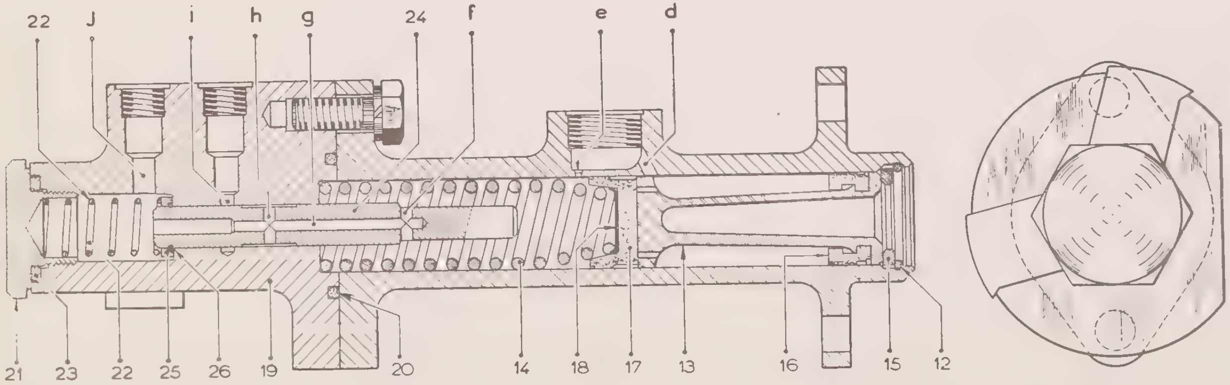


Fig. 2



PARKING BRAKE CONTROL (MECHANICAL)

Fig 1

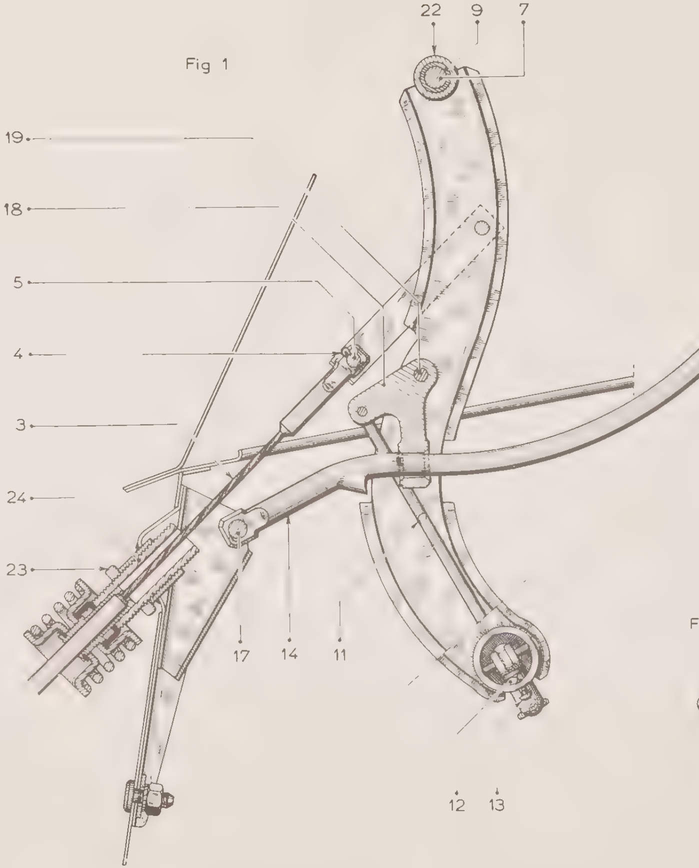
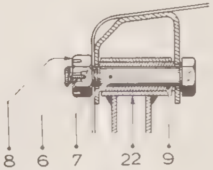


Fig 2



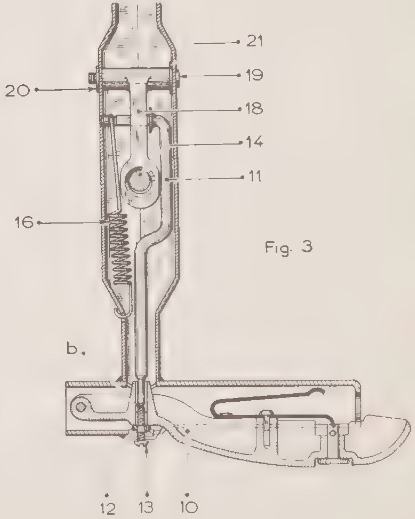
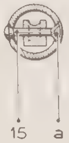


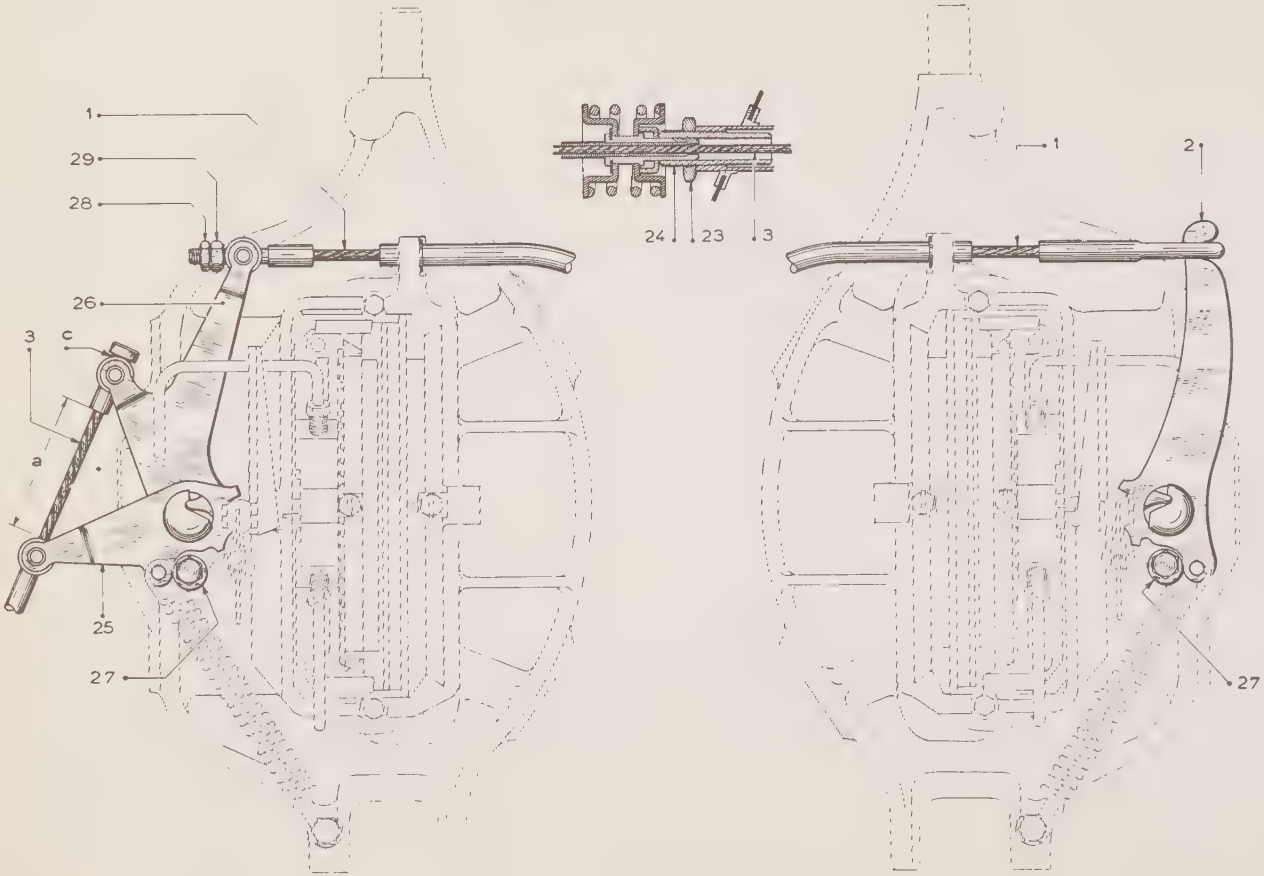
Fig. 3

Fig 4



OPERATIONS
ID 454-0
ID 454-1
ID 454-4

CABLE ADJUSTMENT



LIFTING POINTS ON THE BODY

Fig. 1 — LOCATION OF THE JACKING PAD

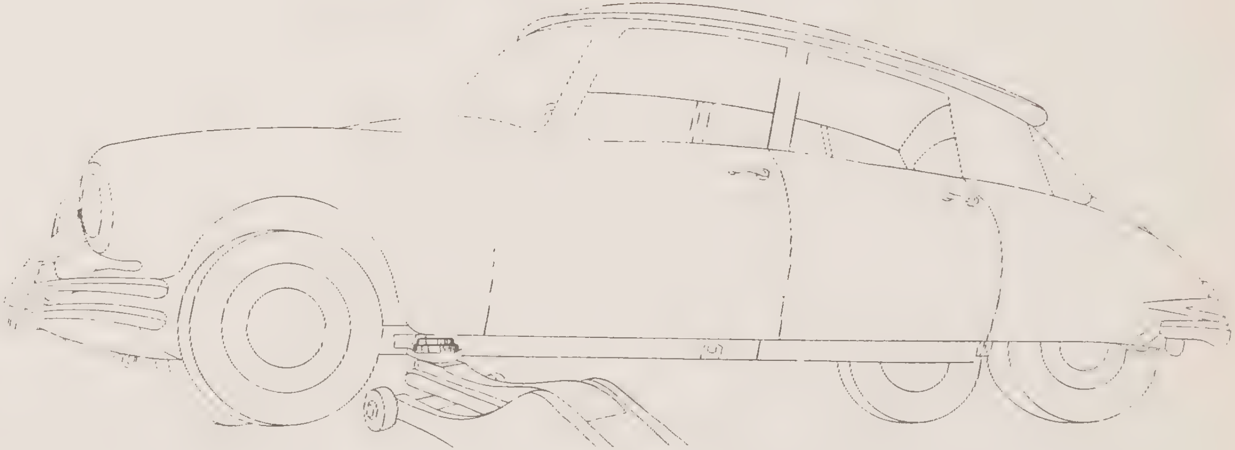
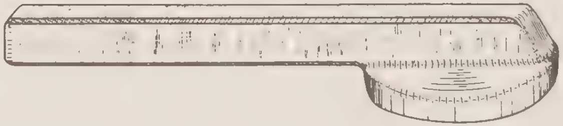


Fig. 2 — JACKING PAD

sold under No.2505–T



CHECKING THE CAMBER

Fig. 1 — METHOD OF USING INSPECTION GAUGE

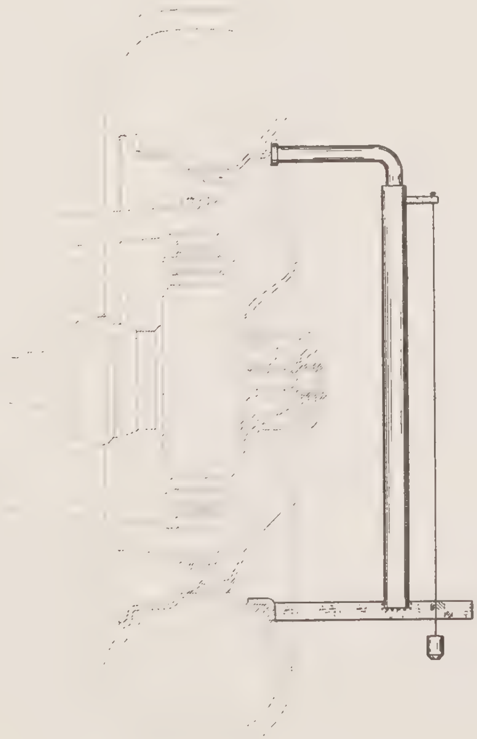
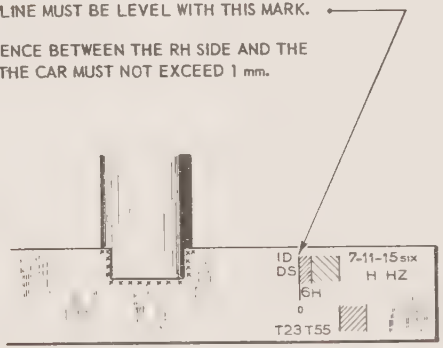


Fig. 2 — DETAILS OF GRADUATION

THE PLUMB-LINE MUST BE LEVEL WITH THIS MARK.

THE DIFFERENCE BETWEEN THE RH SIDE AND THE LH SIDE OF THE CAR MUST NOT EXCEED 1 mm.



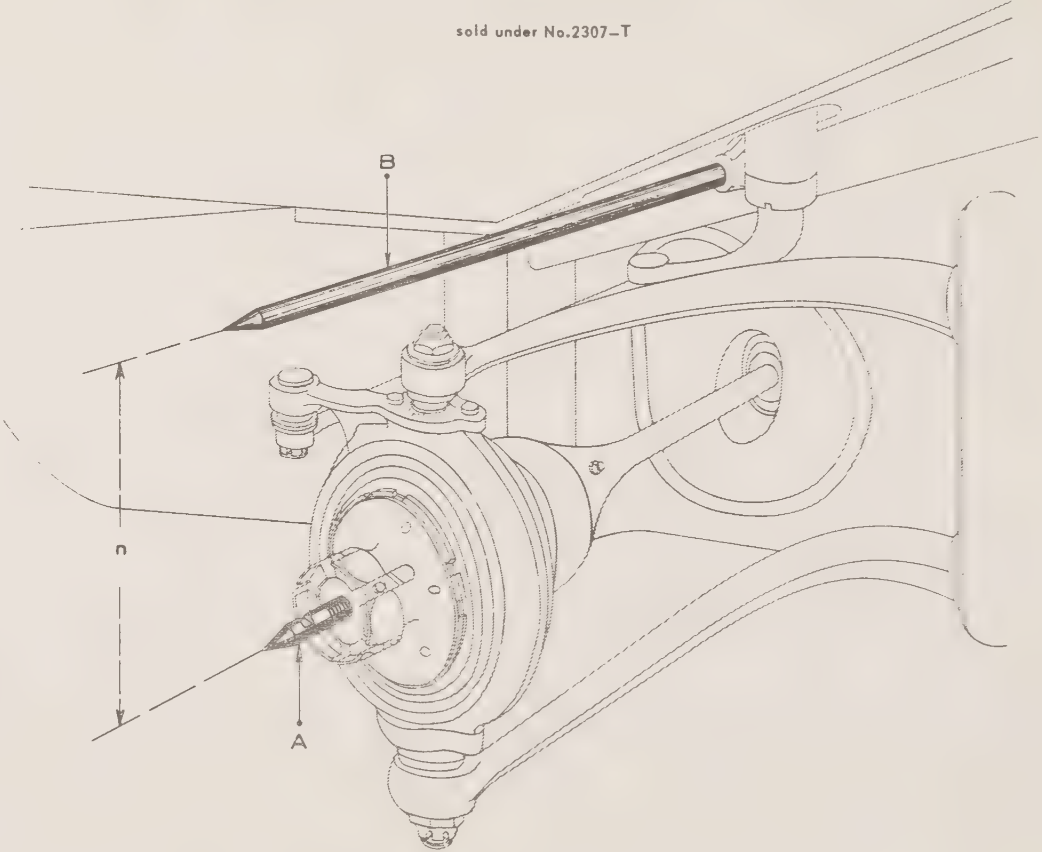
INSPECTION GAUGE

sold under No.2314–T

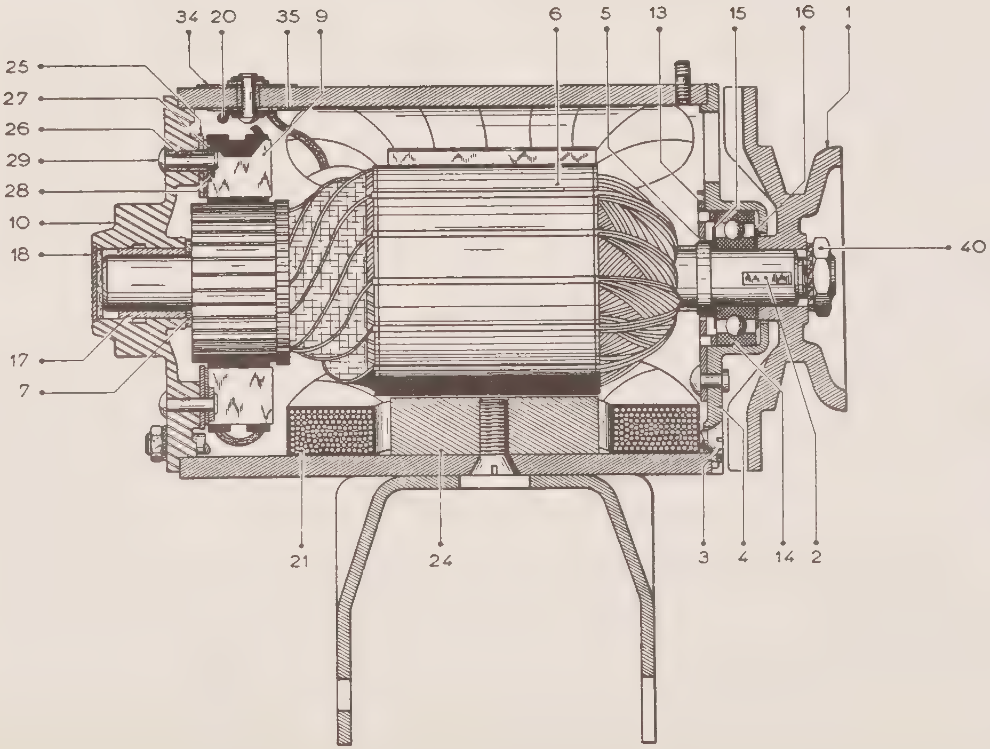
PRE-ADJUSTMENT OF THE FRONT HEIGHT

GAUGE RODS

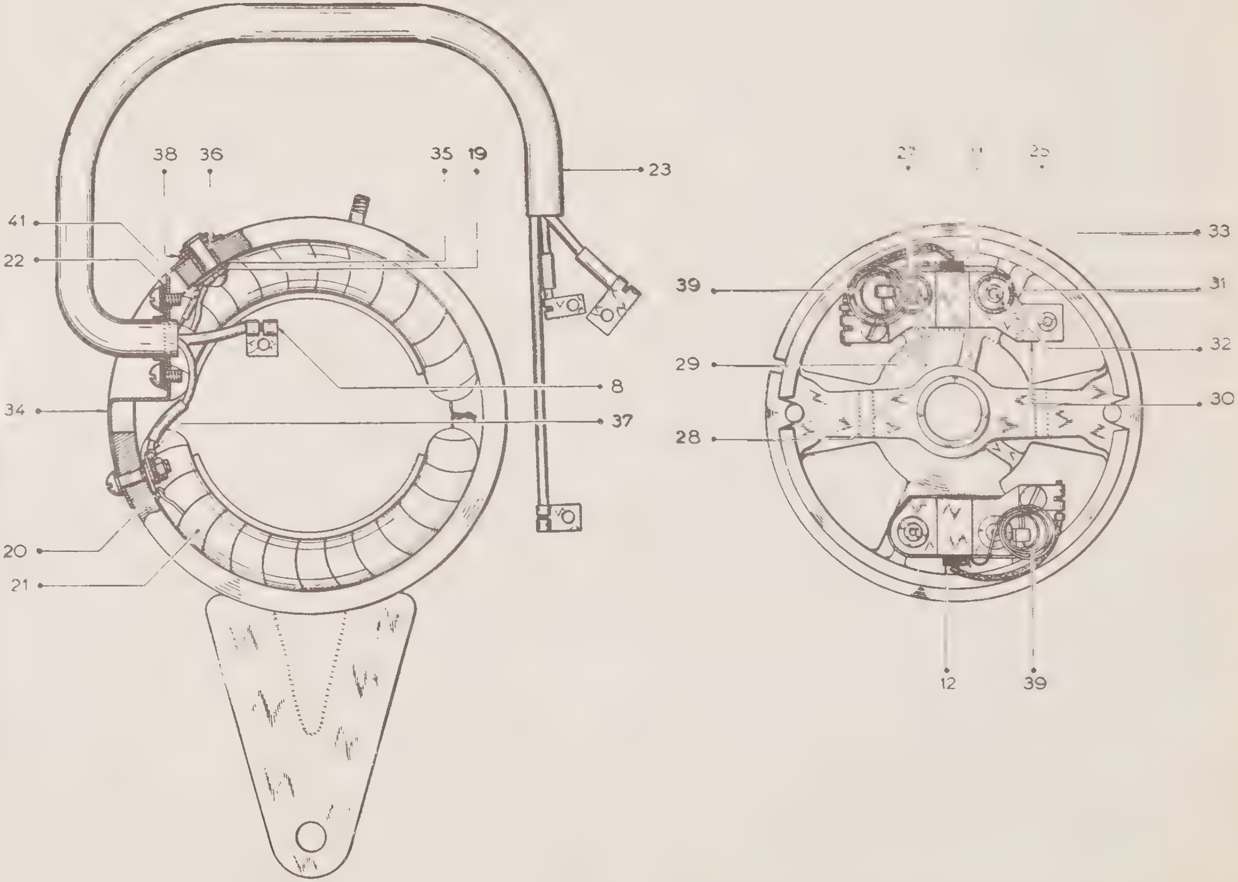
sold under No.2307-T



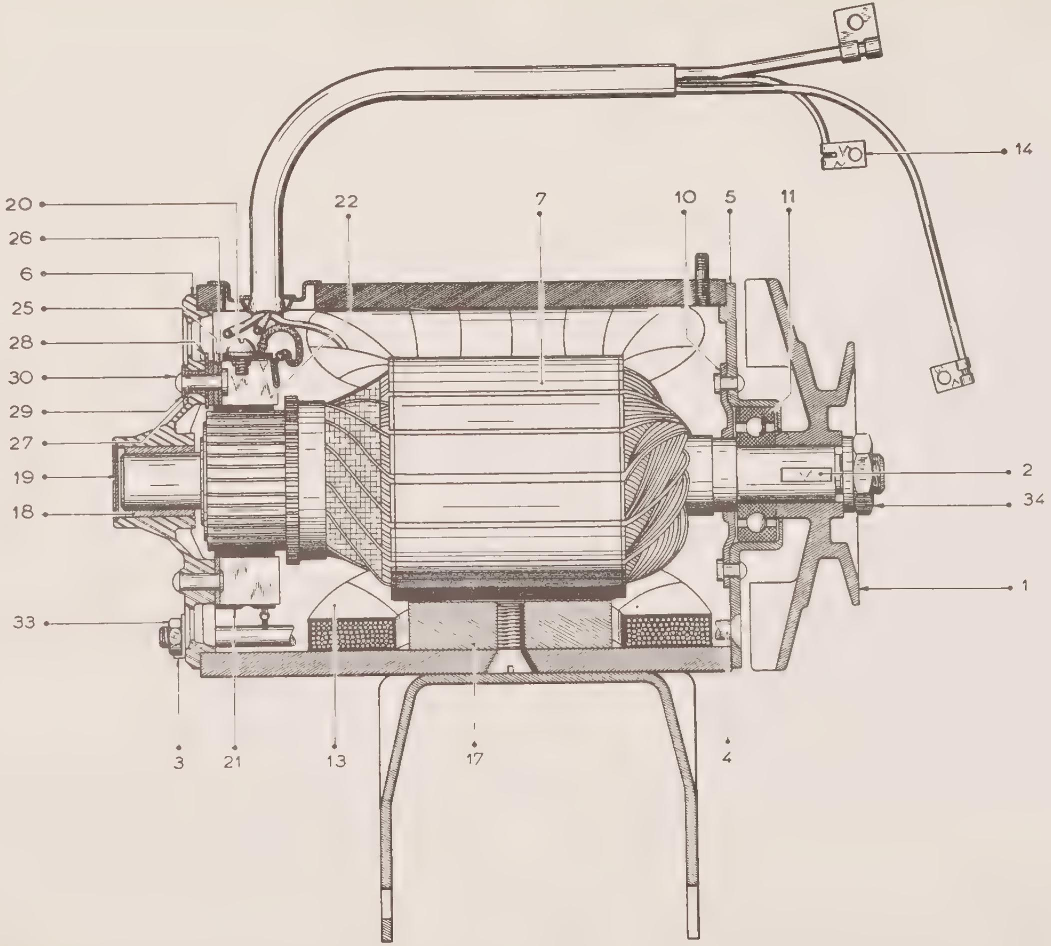
DUCELLIER DYNAMO 7158A



DUCELLIER DYNAMO 7158A



PARIS-RHONE DYNAMO G11R91



OPERATION
ID 532-3

PARIS-RHONE DYNAMO G11R91

Fig 1

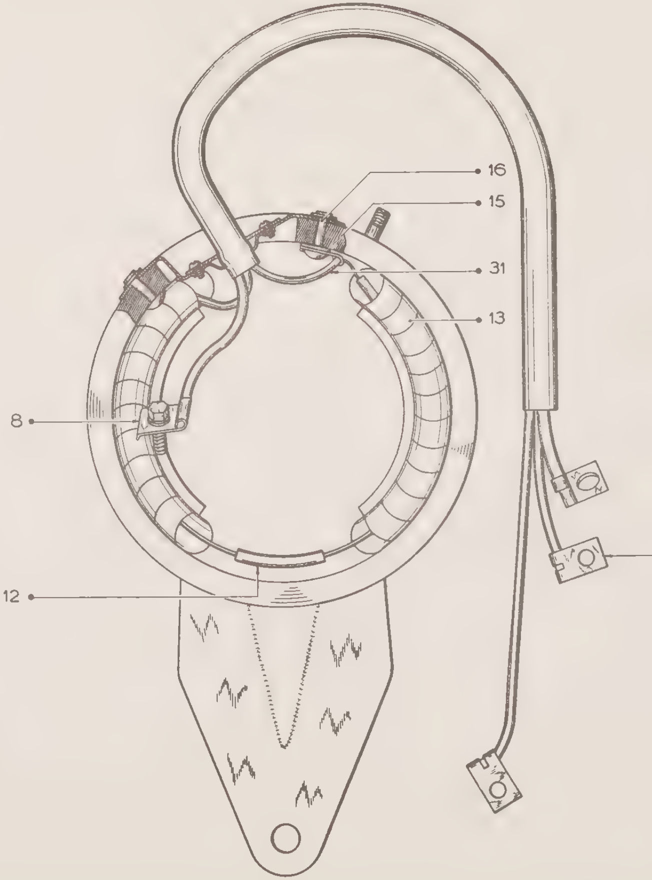
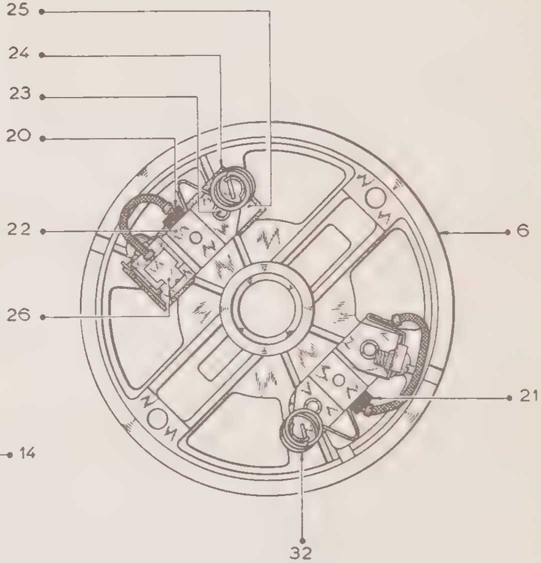
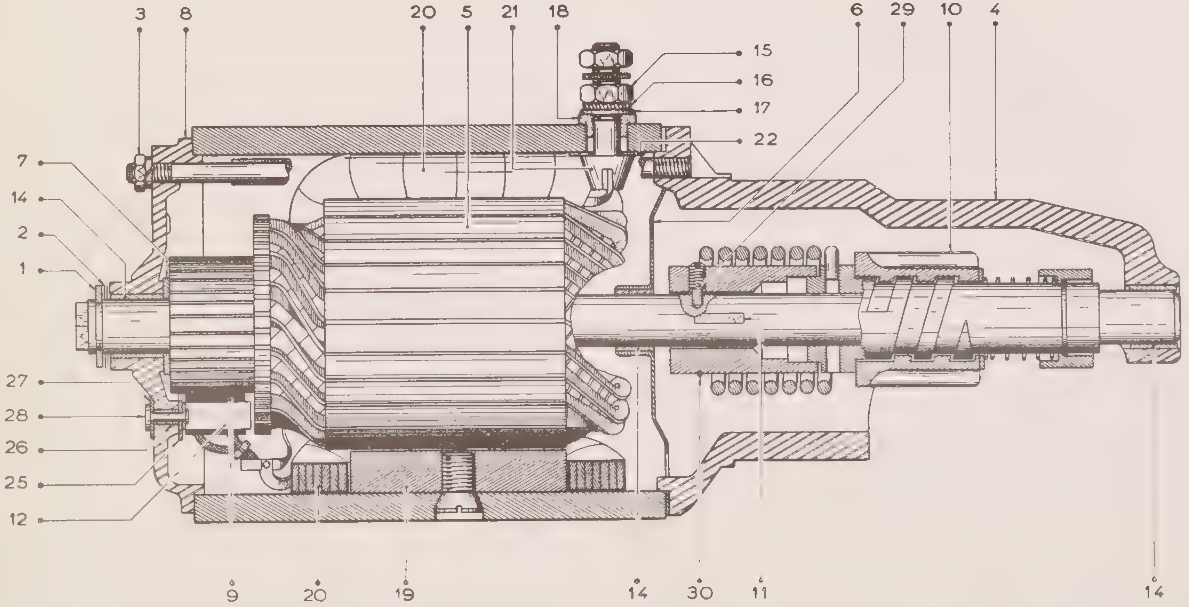


Fig. 2



DUCELLIER STARTER 6003A



DUCELLIER STARTER 6003A

Fig 1

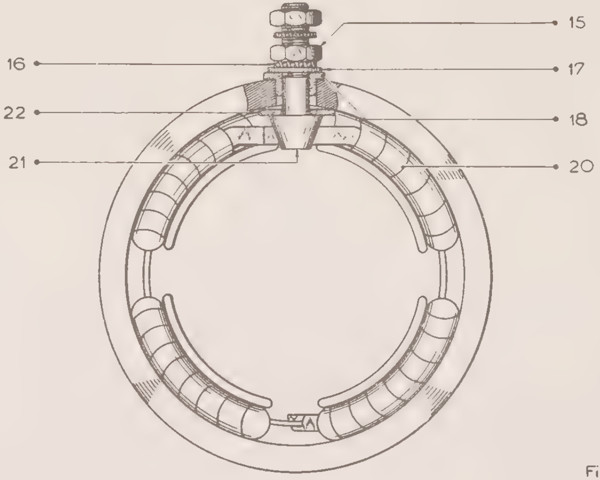


Fig 2

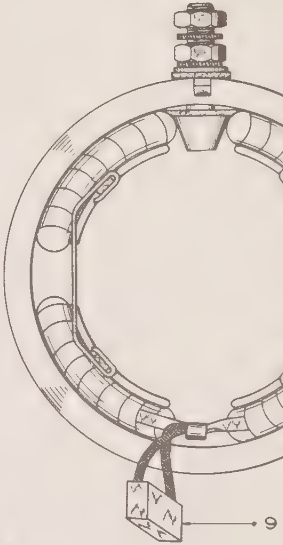
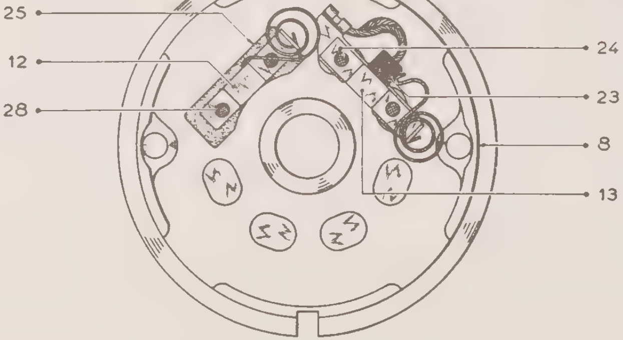
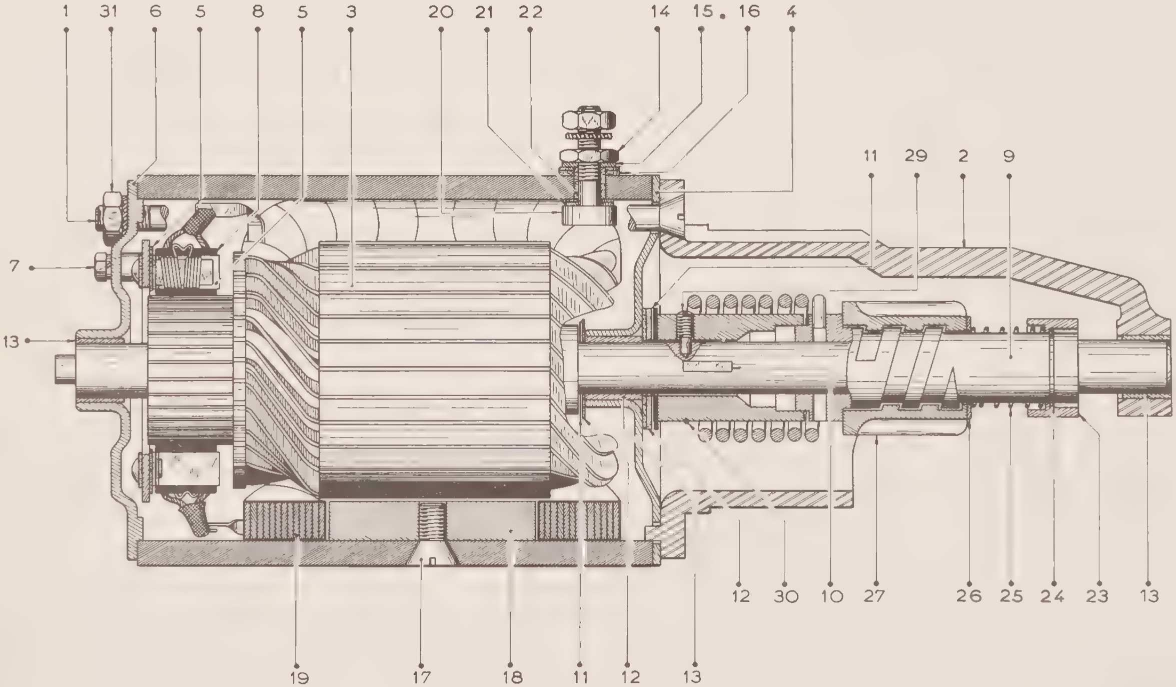


Fig. 3



PARIS-RHONE STARTER D11B42



PARIS-RHONE STARTER D11B42

Fig. 1

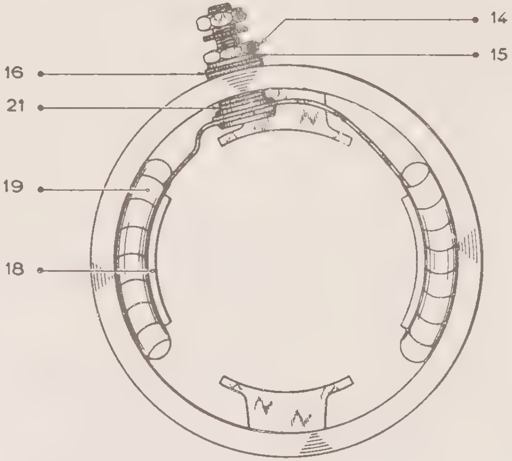


Fig. 2

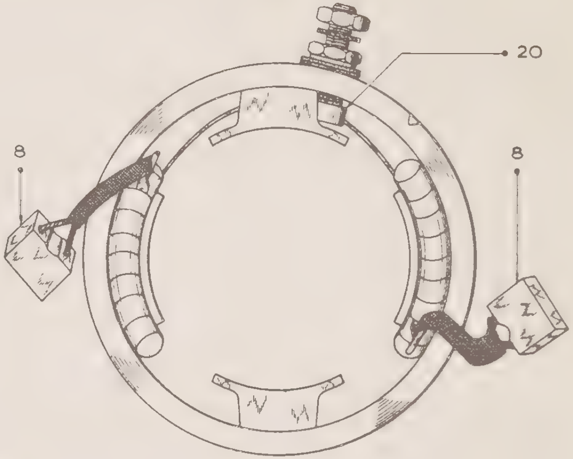
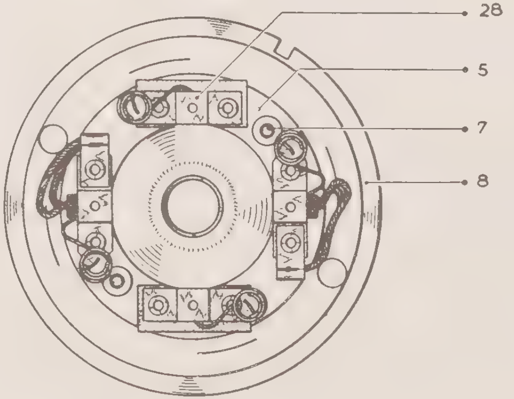


Fig 3



BENADA PINION

Fig 1

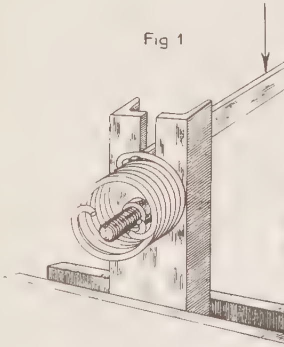


Fig 2

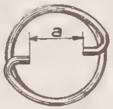


Fig 3

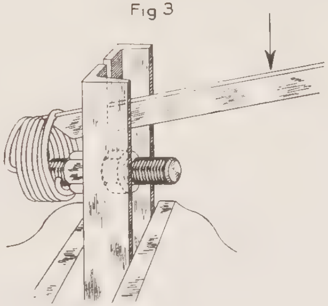


Fig 4

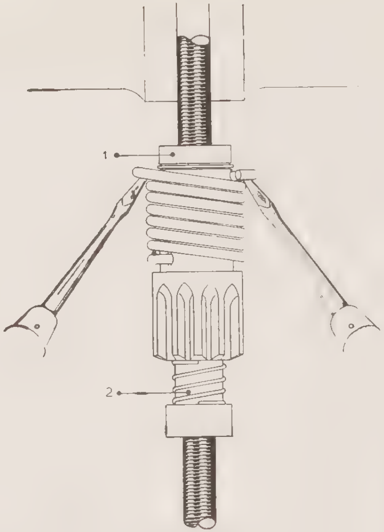


Fig 5

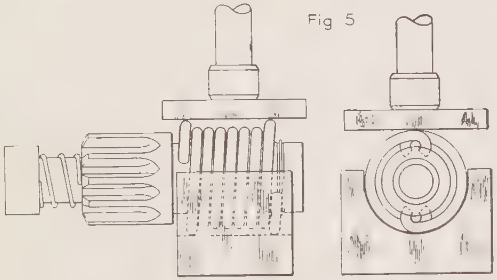


Fig 6 — SUPPORT MR-3526-13

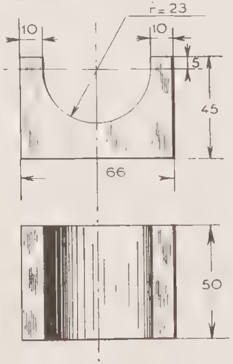


Fig. 7— LEVER MR-3526-12

non vendu

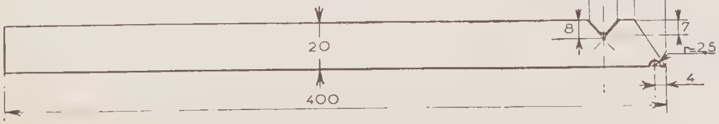
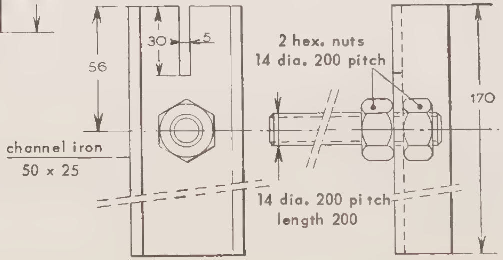


Fig.8 — SUPPORT MR-3526-11

not sold



ASSEMBLY OF THE FIELD COILS AND POLE-PIECES

Fig. 1 _ FORMING THE COILS

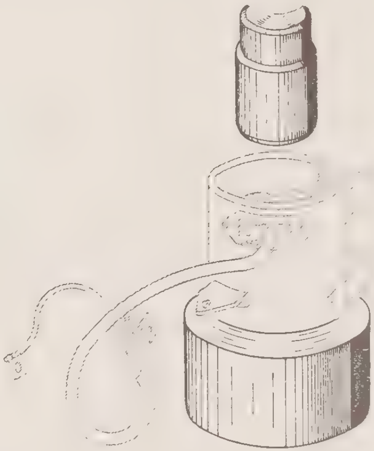
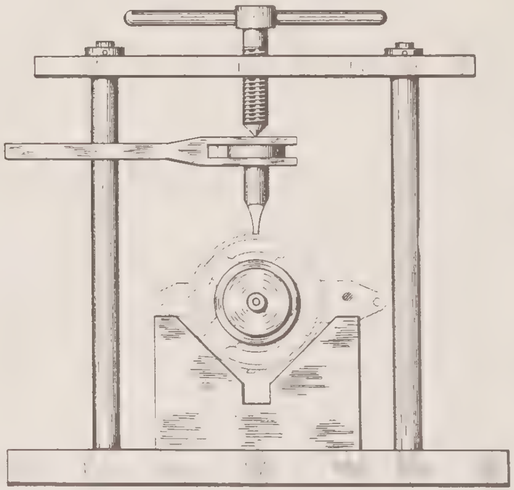


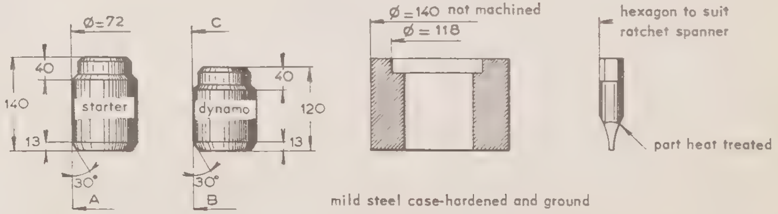
Fig. 2 _ FITTING THE POLE-PIECES



		Paris–Rhone	Ducellier
Starter	A	$\varnothing = 76{,}8^{+0,15}_{-0,10}$	$\varnothing = 74{,}4^{+0,15}_{-0,10}$
Dynamo	B	$\varnothing = 72{,}5$	$\varnothing = 68{,}5$
	C	$\varnothing = 69$	$\varnothing = 65$

MR_1601_1 MR_1601_2 MR_1601_3 MR_1601_4

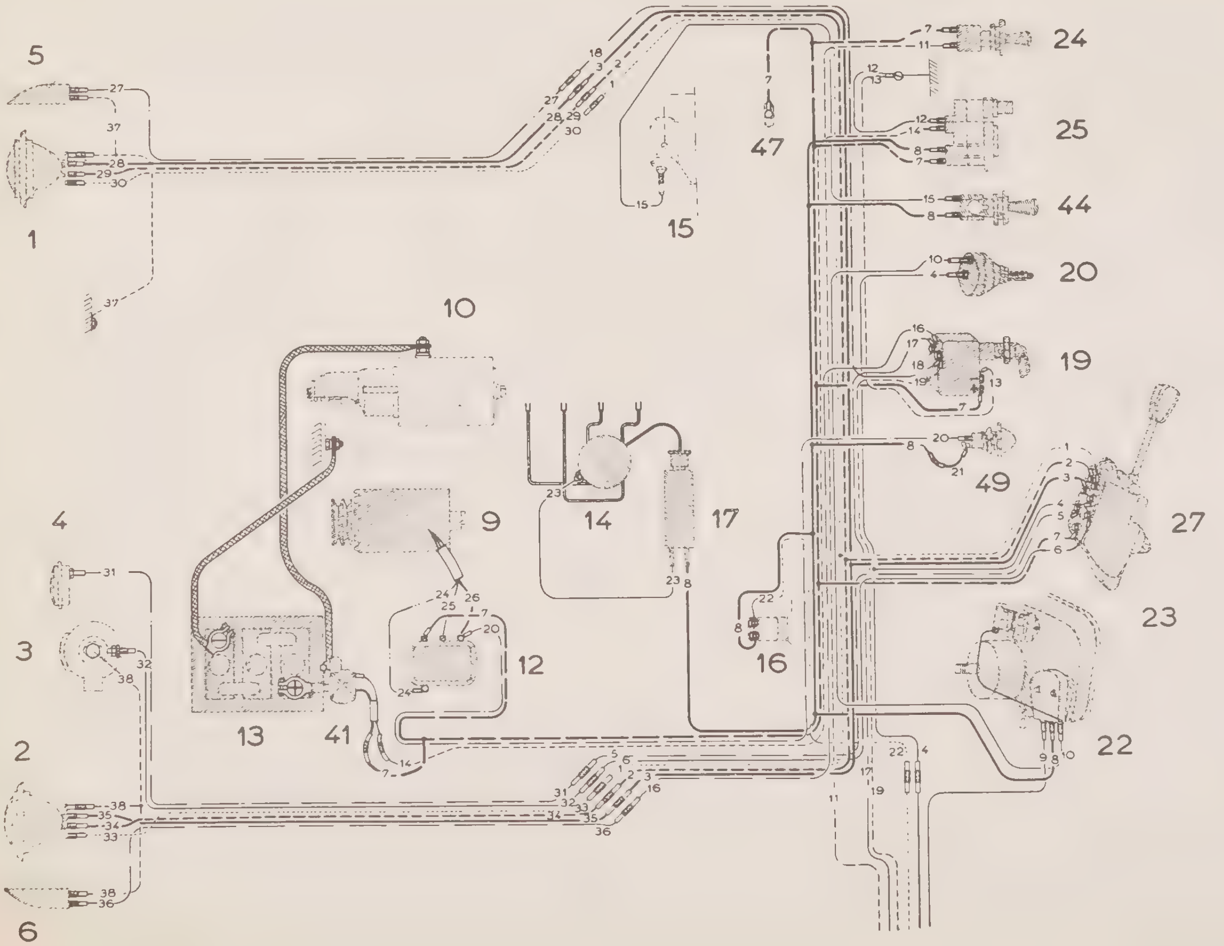
tools not sold



mild steel case-hardened and ground

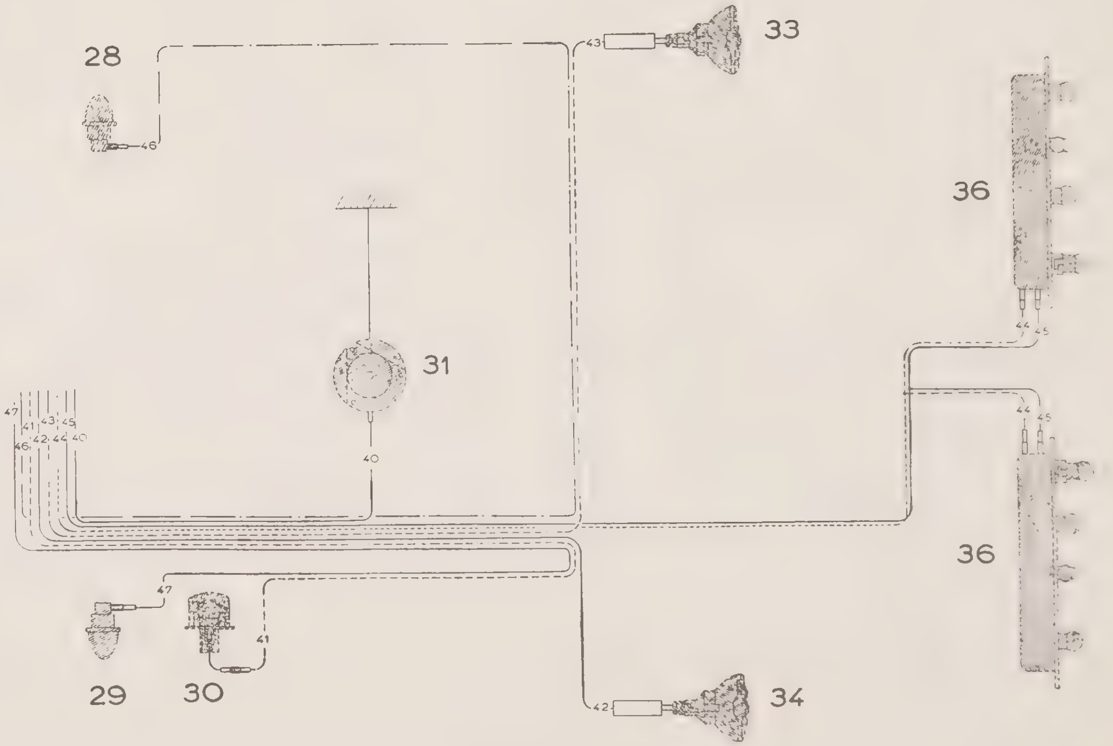
WIRING DIAGRAM

FRONT HARNESS



WIRING DIAGRAM

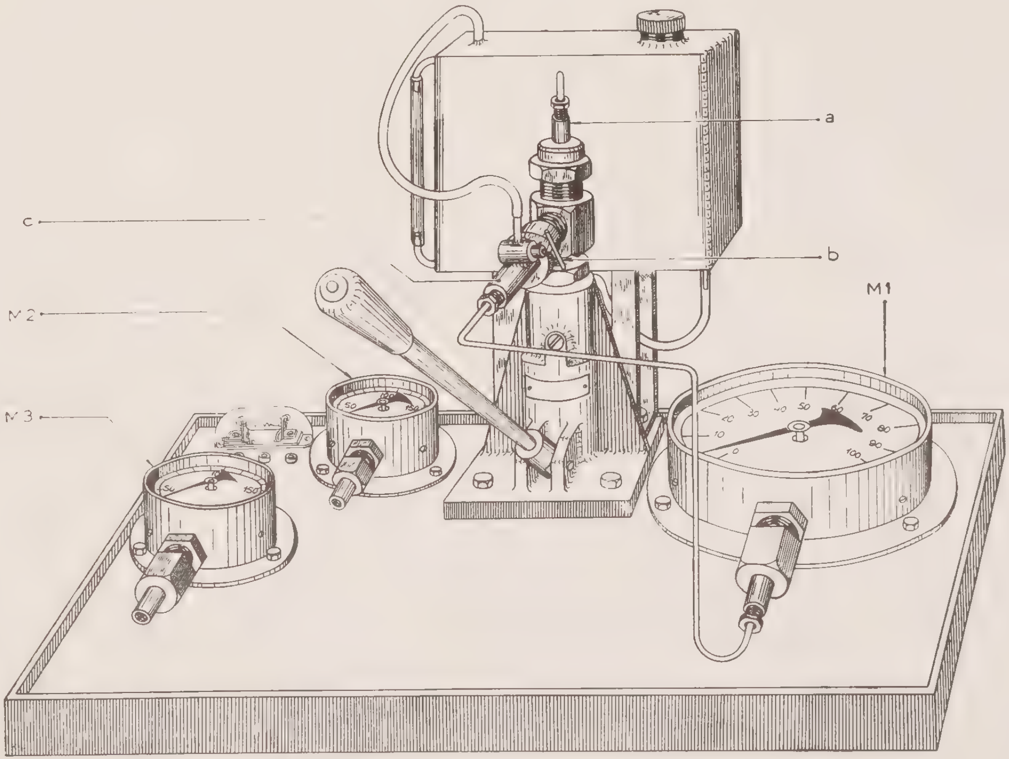
REAR HARNESS



HYDRAULIC

TEST BENCH

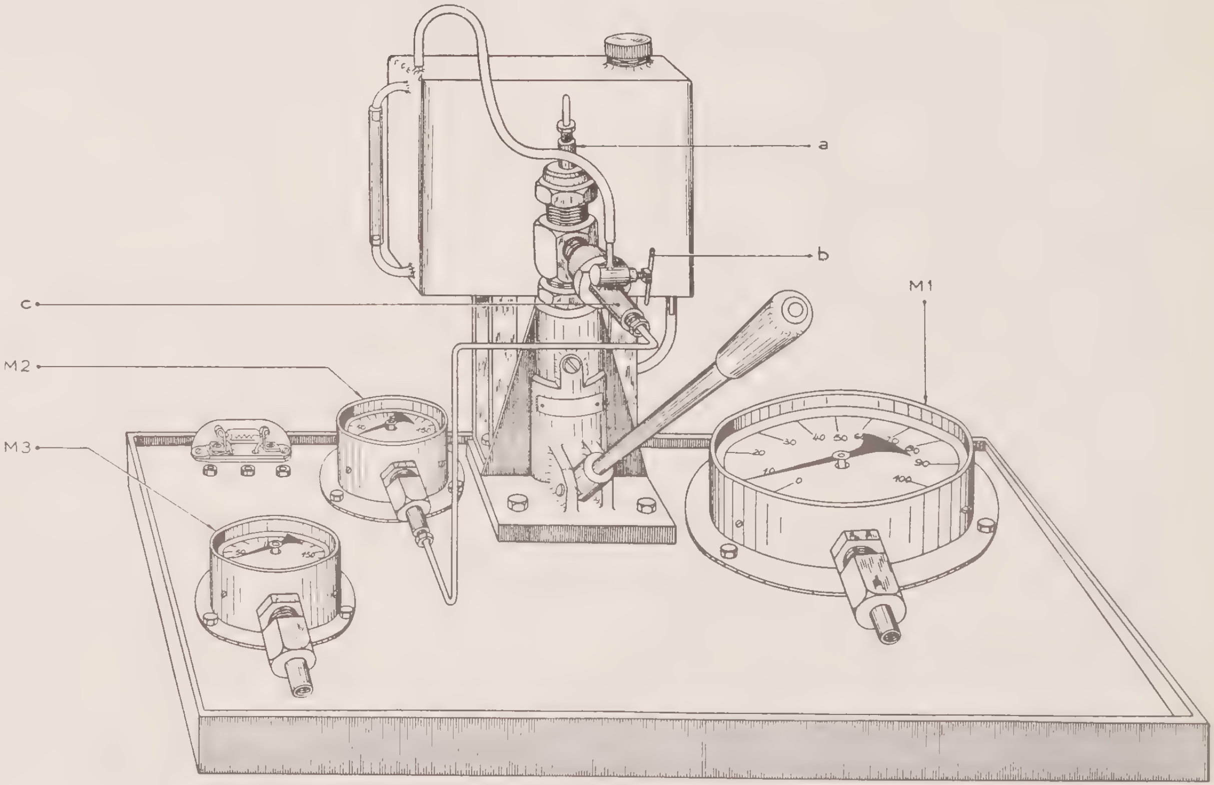
CONNECTION OF THE 1500 P.S.I. (100 kg/cm^2) GAUGE



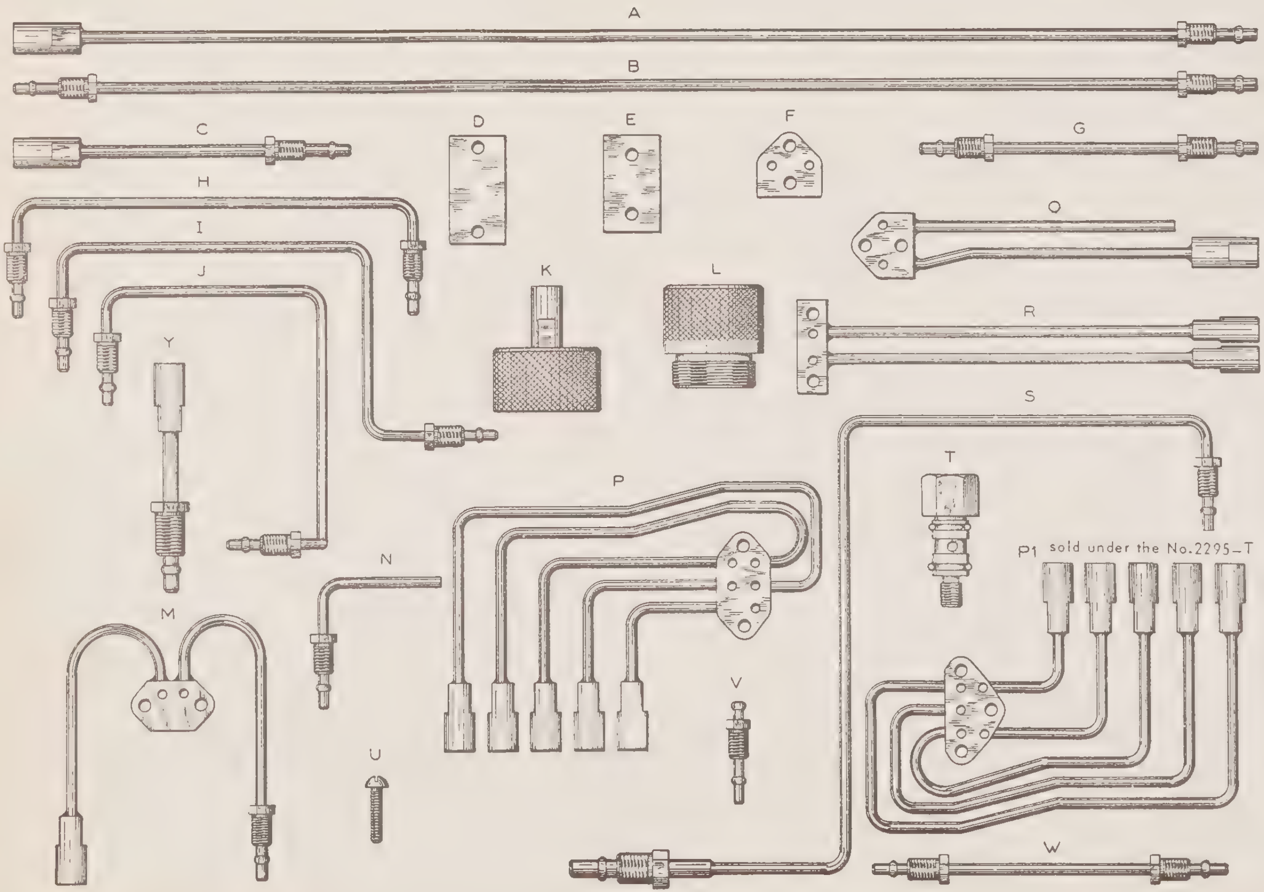
HYDRAULIC

TEST BENCH

CONNECTION OF THE 3000 P.S.I. (200 kg/cm^2) GAUGE

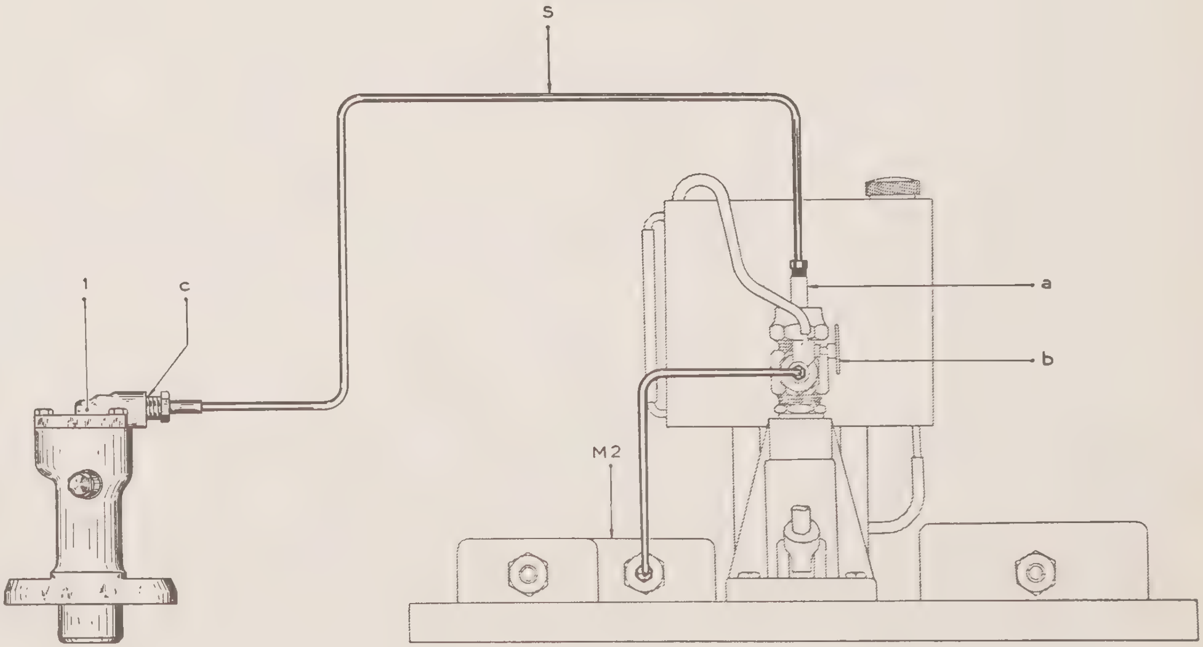


TEST PIPES AND UNIONS



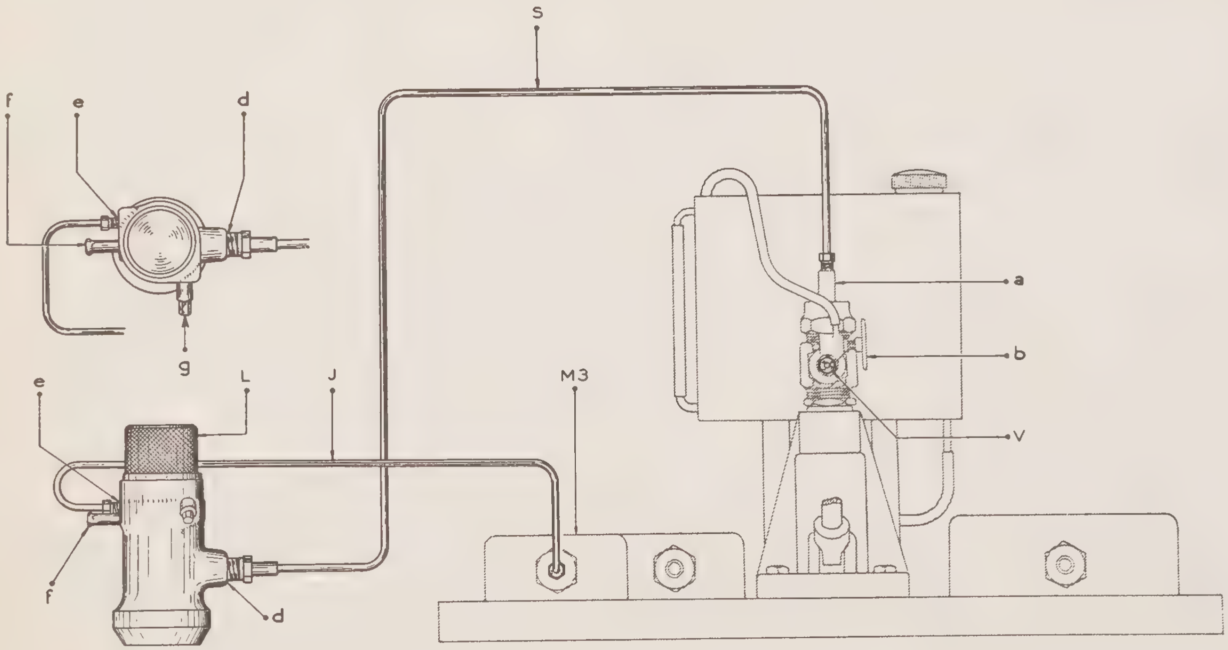
HIGH PRESSURE PUMP

INSPECTION FOR LEAKAGE



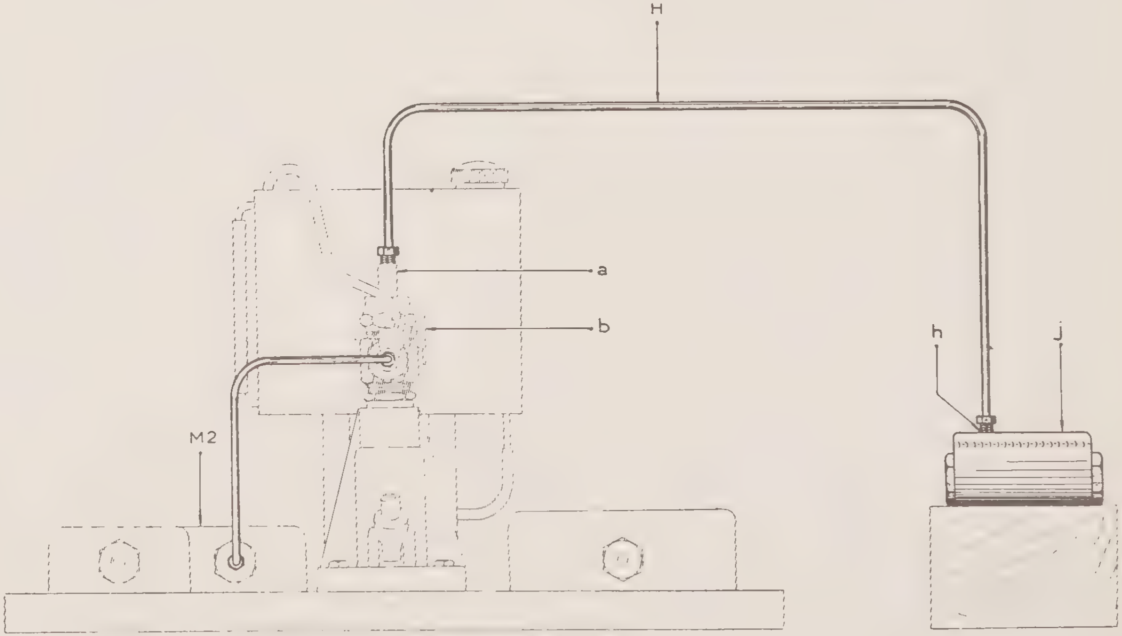
PRESSURE CONTROL VALVE

INSPECTION OF THE CUTTING-IN AND CUTTING-OUT PRESSURES AND FOR LEAKAGE



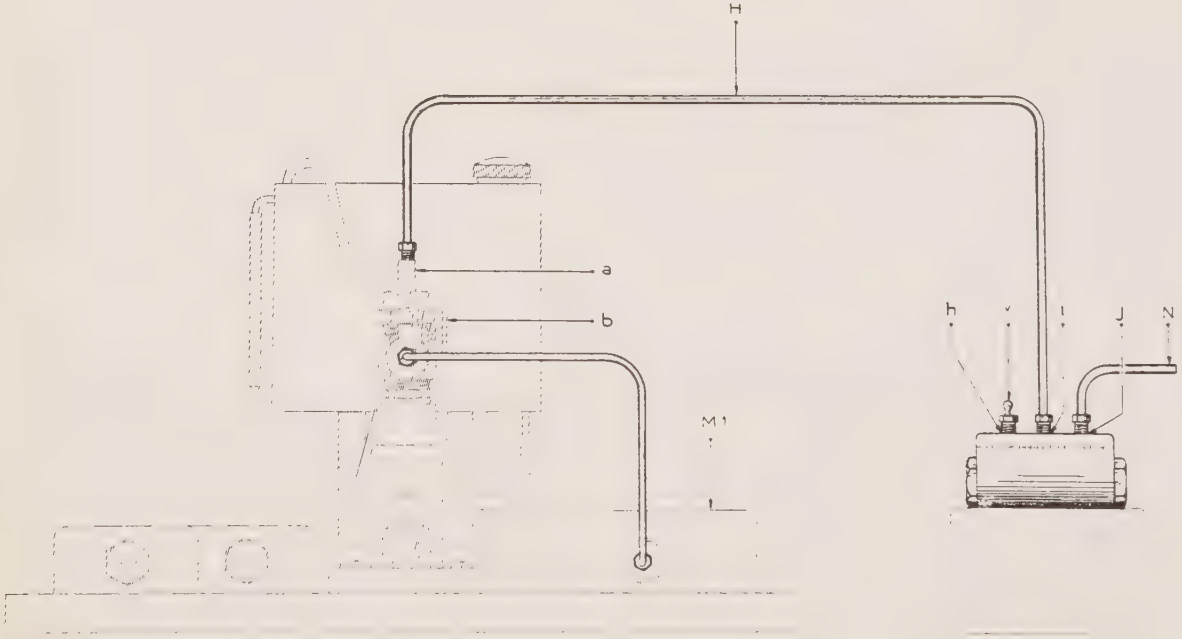
PRESSURE DISTRIBUTION BLOCK

INSPECTION FOR LEAKAGE



PRESSURE DISTRIBUTION BLOCK

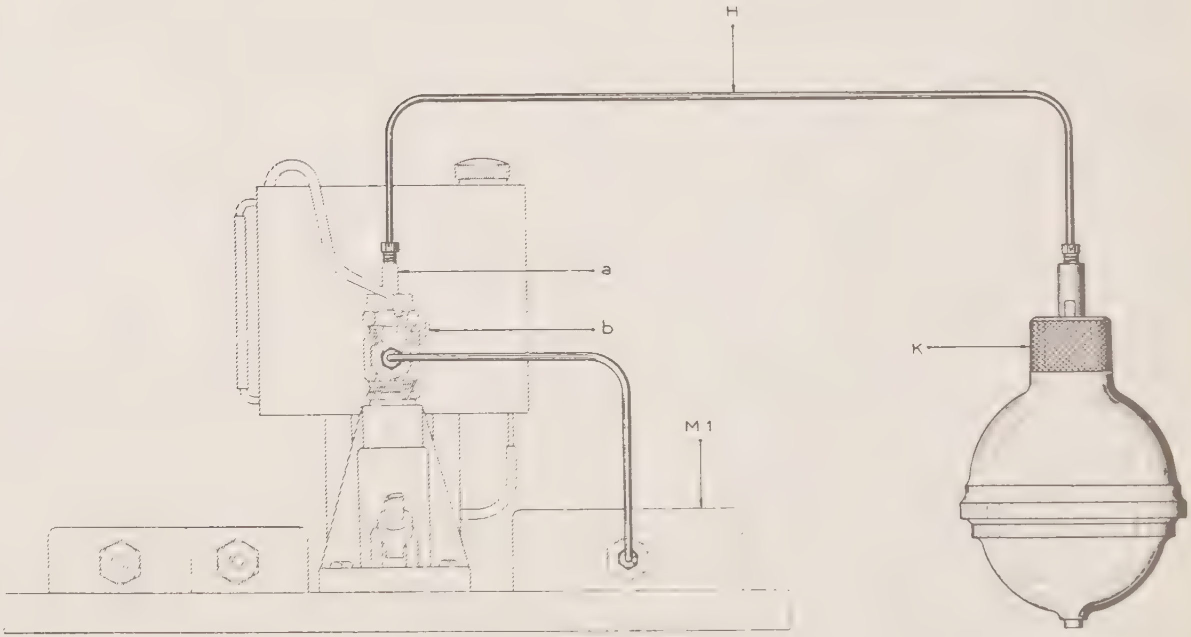
INSPECTION OF THE VALVE SETTINGS



HYDRAULIC

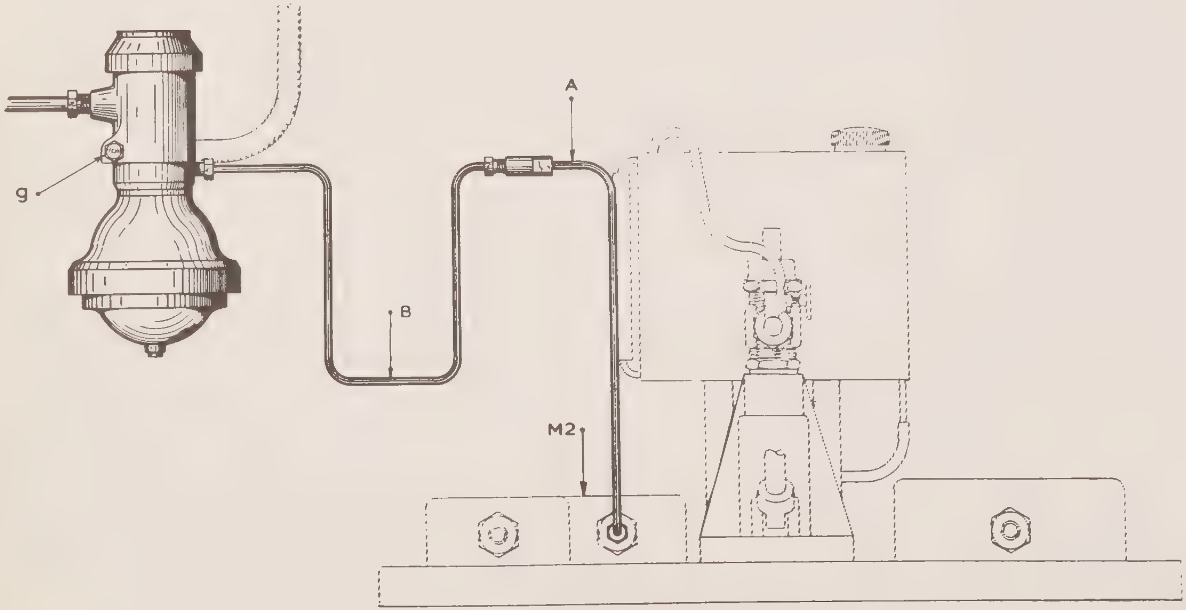
MAIN ACCUMULATOR

PRESSURE TEST



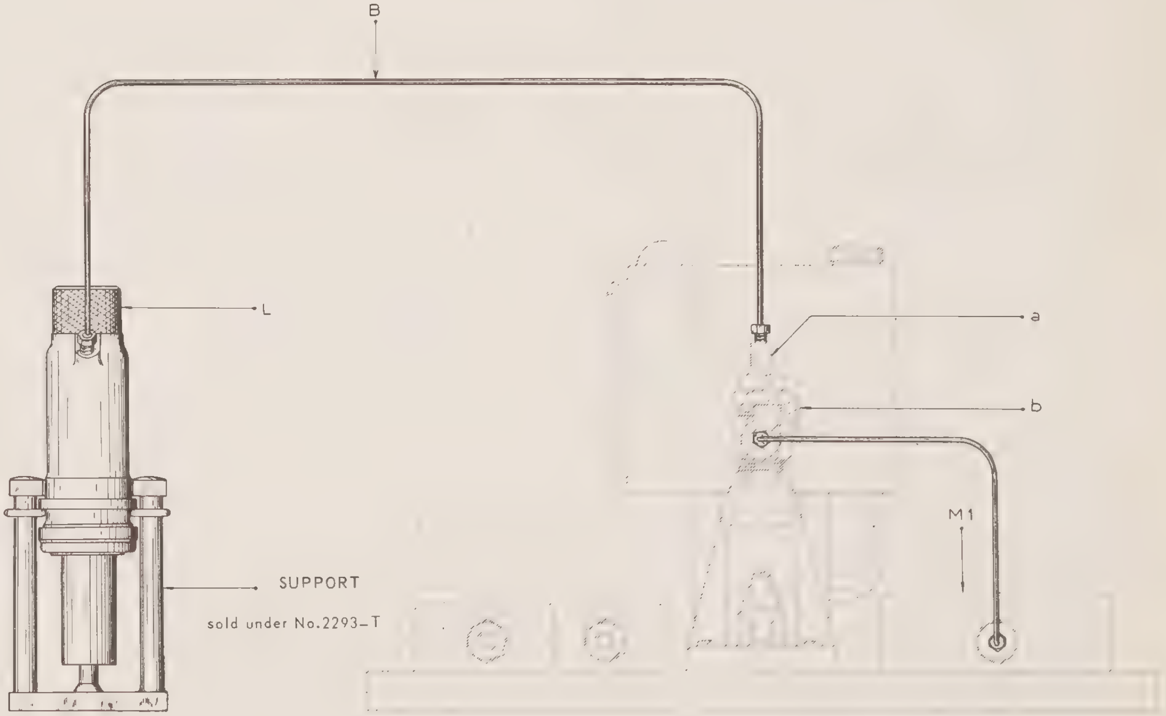
PRESSURE CONTROL VALVE

INSPECTION OF THE CUT-IN AND CUT-OUT AND FOR LEAKAGE ON THE CAR



SUSPENSION CYLINDER

INSPECTION FOR LEAKAGE



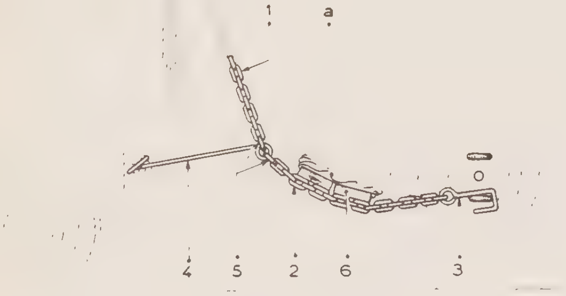
LIFTING FOR TOWING

POINTS OF ANCHORAGE

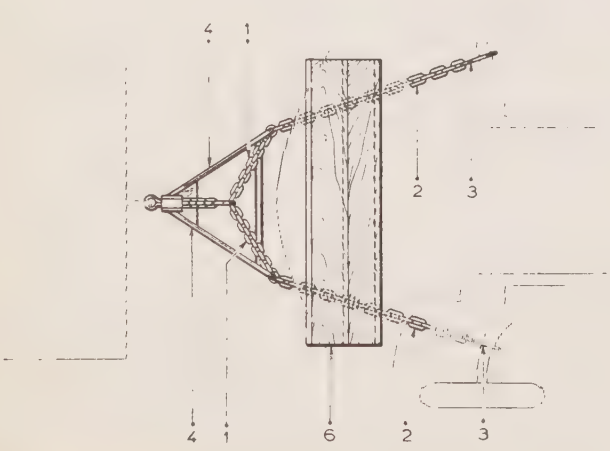
Fig 1 _ LIFTING AT THE FRONT

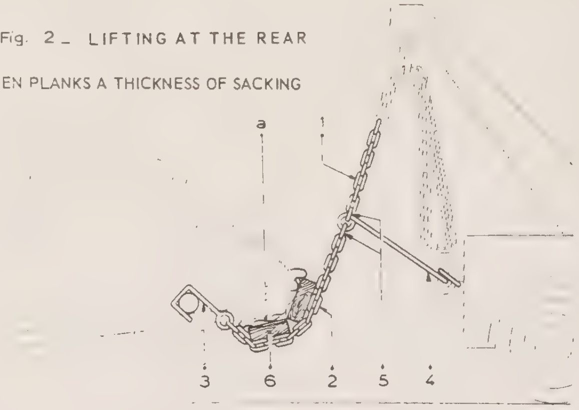
Fig. 2 _ LIFTING AT THE REAR

INSERT AT a BETWEEN THE CHASSIS AND WOODEN PLANKS A THICKNESS OF SACKING

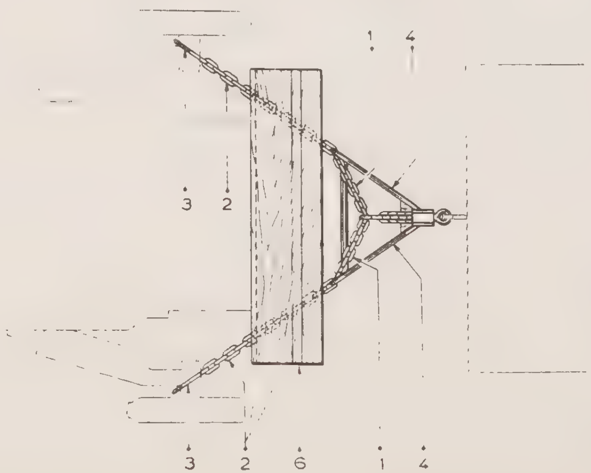


FIT THE HOOKS ON THE LOWER ARMS

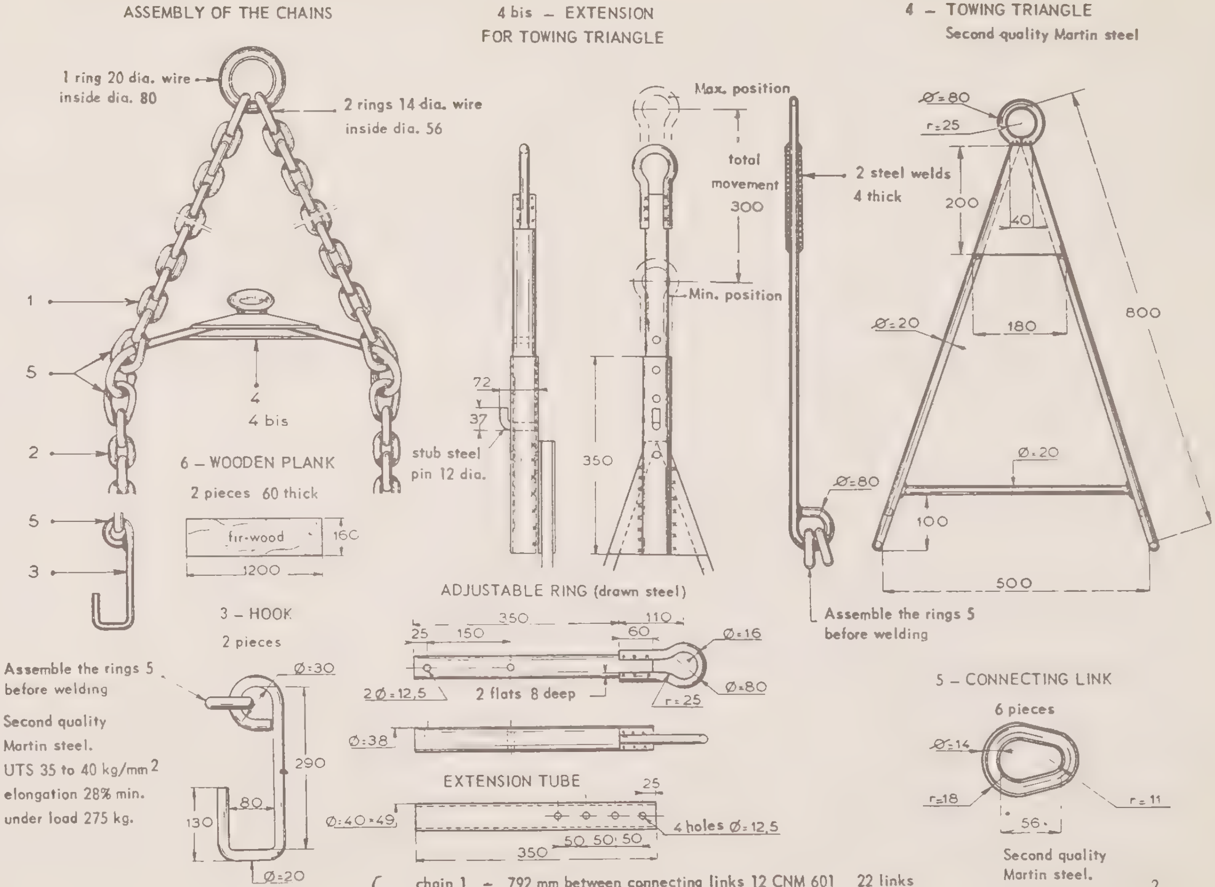




FIT THE HOOKS ON THE HUB OF THE ARMS



LIFTING THE CAR FOR TOWING



Second quality
Martin steel.
UTS 35 to 40 kg/mm^2
elongation 28% min.
under load 275 kg.

Approx. length of chains

chain 1 = 792 mm between connecting links 12 CNM 601 22 links

chain 2 = 900 mm between connecting links 12 CNM 601 25 links

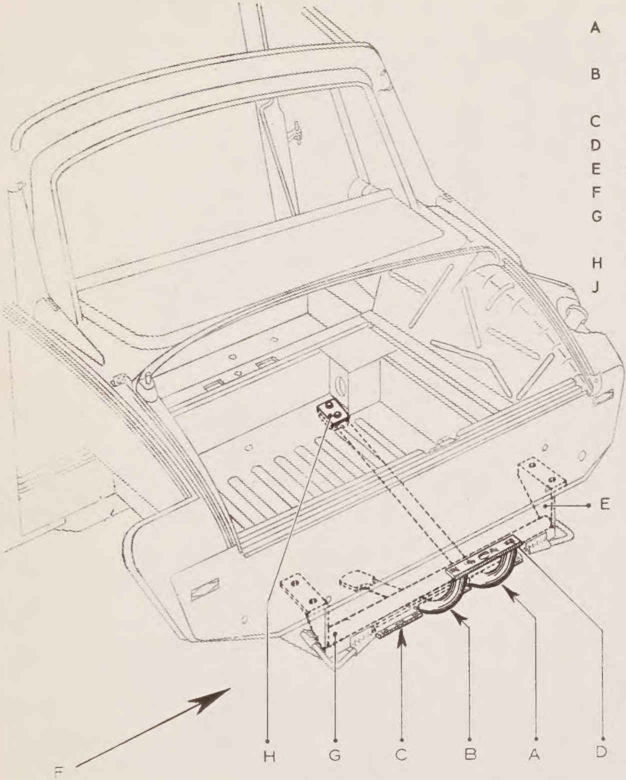
Second quality
Martin steel.
UTS 35 to 40 kg/mm^2
elongation 28% min.
under load 275 kg.

SUPPORT FOR TOWING

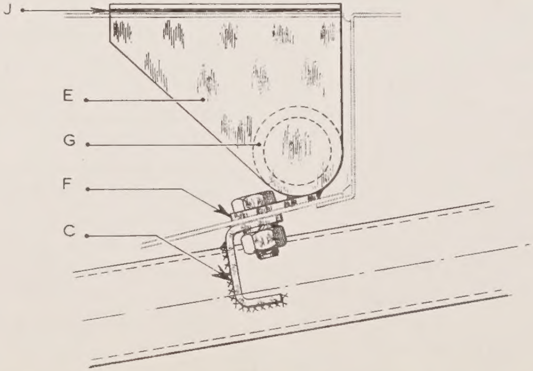
ASSEMBLY

A	1	Cold drawn weldless steel tube 37 x 32 or 33 x 42	Drawn tube, right hand
B	1	Cold drawn weldless steel tube 37 x 42 or 33 x 42	Drawn tube, left hand
C	1	3mm sheet steel	Rear distance piece for draw tubes.
D	1	8mm sheet steel	Fixing plate for ball joint.
E	2	3mm sheet steel	Andle plate securing rear distance piece.
F	1	3mm sheet steel	Plate securing rear distance piece
G	1	Cold drawn weldless steel tube 30 x 39	Transverse rear tubes
H	1	4mm sheet steel	Lockplate securing front of right hand tube.
J	1	Steel thickness as required	Packing piece.

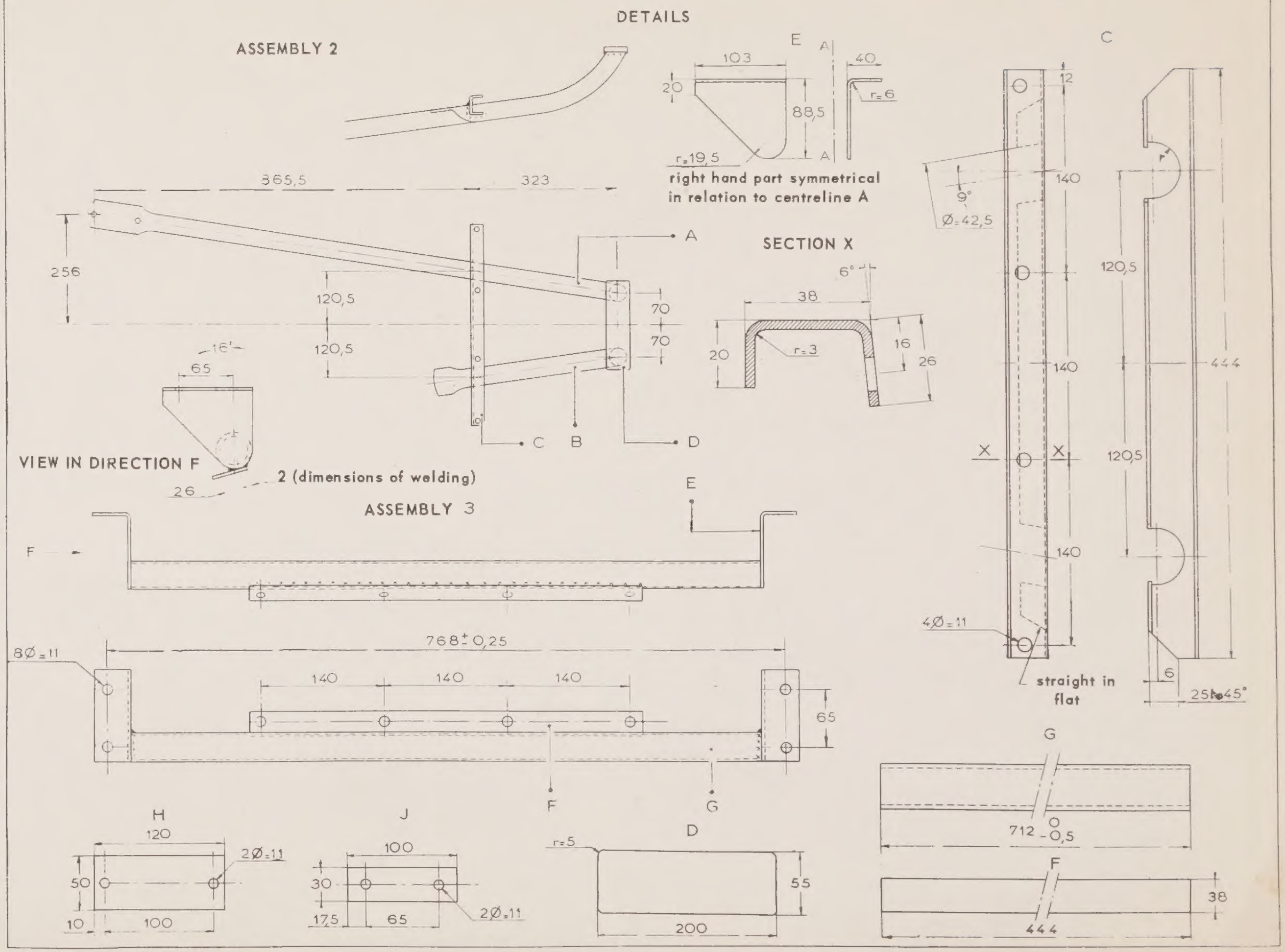
Total permissable weight to be towed - 1650 lbs.



VIEW IN DIRECTION F

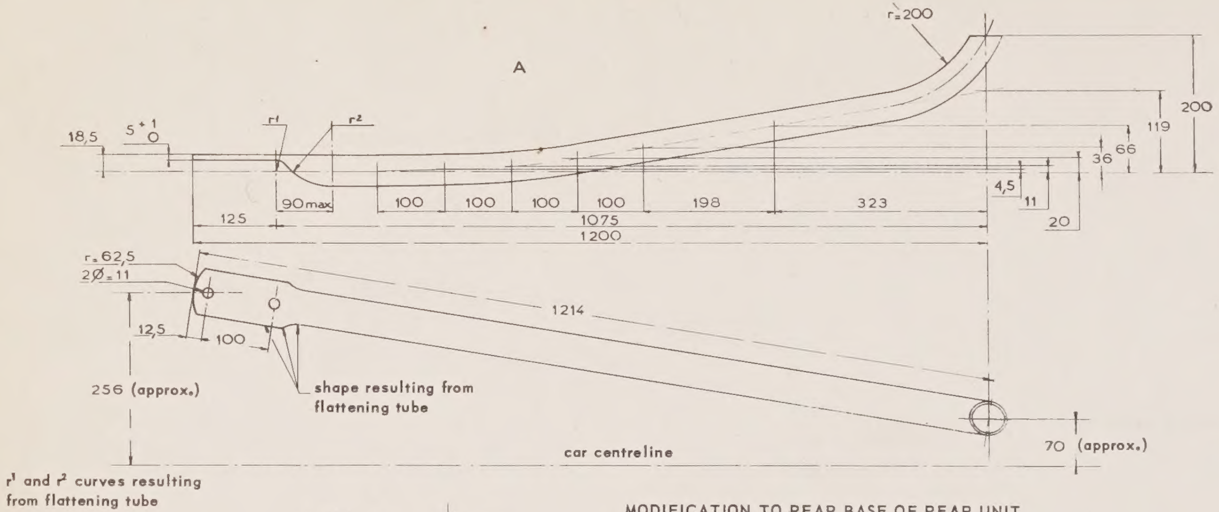


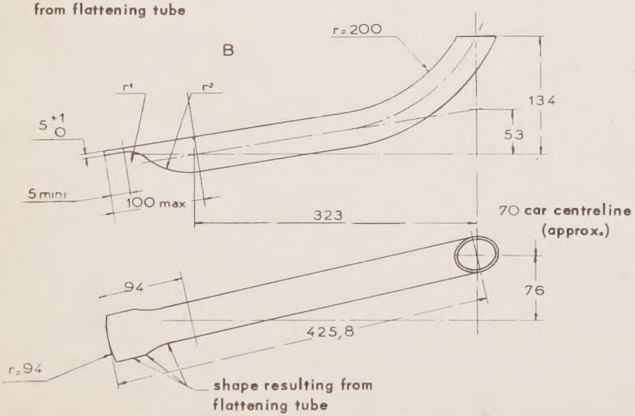
SUPPORT FOR TOWING



SUPPORT FOR TOWING

DETAILS




B
r=200
r¹
r²
5^{+1}_{0}
134
53
5 mini
100 max
323
70 car centreline (approx.)
94
76
425,8
r=94
shape resulting from flattening tube

MODIFICATION TO REAR BASE OF REAR UNIT